Full SAP Calculation Printout

Property Reference	1.F Flat - 10-12 Museum Street	Issued on Date	06/05/2023
Assessment Reference	00001	Prop Type Ref	Flat - 10-12 Museum Street
Property	Museum Street, London, WC1A		

SAP Rating	73 C	DER	33.77	TER	17.22
Environmental	76 C	% DER < TER			-96.11
CO_2 Emissions (t/year)	1.44	DFEE	95.24	TFEE	43.84
Compliance Check	See BREL	% DFEE < TFEE			-117.26
% DPER < TPER	-104.69	DPER	187.96	TPER	91.83

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		52.0000 (1b)	x	3.1100 (2b)	=	161.7200 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	161.7200	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.7500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5813	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.7411	0.7266	0.7120	0.6394	0.6248	0.5522	0.5522	0.5377	0.5813	0.6248	0.6539	0.6830	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	84.6000 (23c)

Effective ac	0.8181	0.8036	0.7890	0.7164	0.7018	0.6292	0.6292	0.6147	0.6583	0.7018	0.7309	0.7600	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.60)			15.1200	1.5038	22.7368			(27)
Solid Door			1.8900	3.0000	5.6700			(26)
1F			52.0000	0.2500	13.0000			(28b)

External Wall 1	58.5900	17.0100	41.5800	0.3000	12.4740	(29a)
Total net area of external elements Aum(A, m2)			110.5900			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.8808	(33)
Party Wall 1			38.5300	0.0000	0.0000	(32)
Party Ceiling 1			52.0000			(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		22.1180 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	75.9988 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.6597	42.8842	42.1087	38.2312	37.4557	33.5782	33.5782	32.8027	35.1292	37.4557	39.0067	40.5577	(38)
Heat transfer coeff	119.6585	118.8830	118.1075	114.2301	113.4546	109.5771	109.5771	108.8016	111.1281	113.4546	115.0056	116.5566	(39)
Average = Sum(39)m / 12 =												114.0362	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.3011	2.2862	2.2713	2.1967	2.1818	2.1073	2.1073	2.0923	2.1371	2.1818	2.2116	2.2415	(40)
HLP (average)												2.1930	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7491	(42)
Hot water usage for mixer showers	66.9321	65.9262	64.4605	61.6561	59.5865	57.2785	55.9666	57.4213	59.0158	61.4939	64.3586	66.6756	(42a)
Hot water usage for baths	23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)
Hot water usage for other uses	32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)
Average daily hot water use (litres/day)												112.7563	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.6239	120.0909	116.9577	112.0772	108.1559	103.9233	102.2111	105.3299	108.6313	113.0858	118.0449	122.2892	(44)
Energy conte	194.2064	171.0079	179.7596	153.4281	145.5986	127.7859	123.6155	130.4204	133.9532	153.4563	168.1765	191.4754	(45)
Energy content (annual)										Total = Sum(45)m =		1872.8838	
Distribution loss (46)m = 0.15 x (45)m	29.1310	25.6512	26.9639	23.0142	21.8398	19.1679	18.5423	19.5631	20.0930	23.0185	25.2265	28.7213	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	245.1653	217.0353	230.7185	202.7432	196.5575	177.1009	174.5744	181.3793	183.2683	204.4152	217.4916	242.4343	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	245.1653	217.0353	230.7185	202.7432	196.5575	177.1009	174.5744	181.3793	183.2683	204.4152	217.4916	242.4343	(64)
										Total per year (kWh/year) = Sum(64)m =		2472.8838	(64)
12Total per year (kWh/year)												2473	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	77.3133	68.3670	72.5098	63.3436	61.1513	54.8176	53.8419	56.1045	56.8682	63.7640	68.2475	76.4053	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8814	85.1187	76.8814	79.4441	76.8814	79.4441	76.8814	76.8814	79.4441	76.8814	79.4441	76.8814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)	103.9158	101.7366	97.4594	87.9773	82.1925	76.1355	72.3681	75.4093	78.9836	85.7042	94.7881	102.6953	(72)
Total internal gains	385.4592	393.0989	376.5986	361.1938	342.1351	325.5737	312.5182	313.9776	324.1005	339.7438	362.1017	377.5132	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	11.7600	11.2829	0.6300	0.7000	0.7700	40.5510 (75)
Southwest	3.3600	36.7938	0.6300	0.7000	0.7700	37.7821 (79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	78.3331	146.8996	236.7716	353.3395	450.5056	471.3243	444.3874	368.2162	276.5584	172.0018	96.2779	65.4496	(83)
Total gains	463.7922	539.9985	613.3703	714.5333	792.6407	796.8980	756.9056	682.1938	600.6589	511.7456	458.3796	442.9628	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.1785	30.3753	30.5748	31.6126	31.8287	32.9550	32.9550	33.1899	32.4950	31.8287	31.3994	30.9816	
alpha	3.0119	3.0250	3.0383	3.1075	3.1219	3.1970	3.1970	3.2127	3.1663	3.1219	3.0933	3.0654	
util living area	0.9905	0.9843	0.9712	0.9334	0.8529	0.7110	0.5726	0.6345	0.8434	0.9569	0.9849	0.9919	(86)
MIT	18.3775	18.6387	19.0881	19.7616	20.3422	20.7636	20.9145	20.8810	20.5453	19.8022	19.0184	18.3882	(87)
Th 2	19.1401	19.1494	19.1586	19.2054	19.2149	19.2628	19.2628	19.2725	19.2435	19.2149	19.1960	19.1772	(88)
util rest of house	0.9870	0.9783	0.9595	0.9044	0.7843	0.5754	0.3740	0.4371	0.7408	0.9321	0.9781	0.9888	(89)
MIT 2	16.8940	17.1583	17.6068	18.2861	18.8141	19.1708	19.2476	19.2473	19.0223	18.3465	17.5674	16.9285	(90)
Living area fraction									fLA = Living area / (4) =			0.4683	(91)
MIT	17.5887	17.8515	18.3004	18.9771	19.5296	19.9167	20.0281	20.0123	19.7355	19.0282	18.2469	17.6120	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5887	17.8515	18.3004	18.9771	19.5296	19.9167	20.0281	20.0123	19.7355	19.0282	18.2469	17.6120	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9826	0.9723	0.9520	0.8997	0.7987	0.6323	0.4682	0.5301	0.7756	0.9285	0.9729	0.9849	(94)
Useful gains	455.7014	525.0449	583.9327	642.8440	633.0599	503.8999	354.3719	361.6156	465.8679	475.1800	445.9648	436.2729	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1590.1045	1539.7161	1393.7186	1151.1028	888.3077	582.5841	375.6434	393.0244	626.2595	956.2128	1281.9548	1563.2622	(97)
Space heating kWh	843.9959	681.8591	602.4807	365.9464	189.9043	0.0000	0.0000	0.0000	0.0000	357.8884	601.9128	838.4801	(98a)
Space heating requirement - total per year (kWh/year)												4482.4676	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	843.9959	681.8591	602.4807	365.9464	189.9043	0.0000	0.0000	0.0000	0.0000	357.8884	601.9128	838.4801	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4482.4676	
Space heating per m2											(98c) / (4) =	86.2013	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	84.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	843.9959	681.8591	602.4807	365.9464	189.9043	0.0000	0.0000	0.0000	0.0000	357.8884	601.9128	838.4801	(98)
Space heating efficiency (main heating system 1)	84.4000	84.4000	84.4000	84.4000	84.4000	0.0000	0.0000	0.0000	0.0000	84.4000	84.4000	84.4000	(210)
Space heating fuel (main heating system)	999.9951	807.8899	713.8397	433.5857	225.0051	0.0000	0.0000	0.0000	0.0000	424.0384	713.1668	993.4598	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	245.1653	217.0353	230.7185	202.7432	196.5575	177.1009	174.5744	181.3793	183.2683	204.4152	217.4916	242.4343	(64)
Efficiency of water heater												89.4000	(216)
(217)m	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	(217)
Fuel for water heating, kWh/month	274.2341	242.7688	258.0744	226.7821	219.8630	198.0995	195.2734	202.8851	204.9981	228.6524	243.2792	271.1793	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	24.9658	22.5498	24.9658	24.1605	24.9658	24.1605	24.9658	24.9658	24.1605	24.9658	24.1605	24.9658	(231)
Lighting	16.3445	13.1121	11.8060	8.6496	6.6812	5.4586	6.0948	7.9223	10.2903	13.5014	15.2498	16.7987	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													

(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	5310.9806	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.4000	
Water heating fuel used	2766.0893	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.7000, SFP = 1.0540)		
mechanical ventilation fans (SFP = 1.0540)	207.9525	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	293.9525	(231)
Electricity for lighting (calculated in Appendix L)	131.9093	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	8502.9316	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5310.9806	0.2100	1115.3059	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2766.0893	0.2100	580.8787	(264)
Space and water heating			1696.1847	(265)
Pumps, fans and electric keep-hot	293.9525	0.1387	40.7748	(267)
Energy for lighting	131.9093	0.1443	19.0386	(268)
Total CO2, kg/year			1755.9981	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			33.7700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	5310.9806	1.1300	6001.4080	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2766.0893	1.1300	3125.6809	(278)
Space and water heating			9127.0889	(279)
Pumps, fans and electric keep-hot	293.9525	1.5128	444.6914	(281)
Energy for lighting	131.9093	1.5338	202.3269	(282)
Total Primary energy kWh/year			9774.1071	(286)
Dwelling Primary energy Rate (DPER)			187.9600	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		52.0000 (1b)	x	3.1100 (2b)	=	161.7200 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	161.7200	(5)

2. Ventilation rate

			m3 per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
			Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1237 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3737 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2896 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3692	0.3620	0.3548	0.3186	0.3113	0.2751	0.2751	0.2679	0.2896	0.3113	0.3258	0.3403	(22b)
Effective ac	0.5682	0.5655	0.5629	0.5507	0.5485	0.5378	0.5378	0.5359	0.5419	0.5485	0.5531	0.5579	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.1100	1.1450	12.7214			(27)
1F			52.0000	0.1300	6.7600			(28b)
External Wall 1	58.5900	13.0000	45.5900	0.1800	8.2062			(29a)
Total net area of external elements Aum(A, m2)			110.5900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.5776			(33)
Party Wall 1			38.5300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		5.5295 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	35.1071 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.3217	30.1804	30.0420	29.3916	29.2699	28.7034	28.7034	28.5986	28.9216	29.2699	29.5161	29.7734	(38)
Heat transfer coeff	65.4288	65.2875	65.1490	64.4987	64.3770	63.8105	63.8105	63.7056	64.0287	64.3770	64.6231	64.8805	(39)
Average = Sum(39)m / 12 =												64.4981	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2582	1.2555	1.2529	1.2404	1.2380	1.2271	1.2271	1.2251	1.2313	1.2380	1.2428	1.2477	(40)
HLP (average)												1.2403	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7491 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.5457	52.7410	51.5684	49.3249	47.6692	45.8228	44.7733	45.9370	47.2127	49.1951	51.4869	53.3405	(42a)

Hot water usage for baths

23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)

Hot water usage for other uses

32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)

Average daily hot water use (litres/day)	100.4145 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.2375	106.9057	104.0656	99.7460	96.2386	92.4676	91.0178	93.8456	96.8281	100.7870	105.1731	108.9541	(44)
Energy conte	173.0055	152.2323	159.9449	136.5473	129.5556	113.6997	110.0781	116.2005	119.3987	136.7670	149.8384	170.5958	(45)
Energy content (annual)										Total = Sum(45)m =		1667.8640	
Distribution loss (46)m = 0.15 x (45)m	25.9508	22.8348	23.9917	20.4821	19.4333	17.0550	16.5117	17.4301	17.9098	20.5151	22.4758	25.5894	(46)
Water storage loss:													
Total storage loss													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.1898	49.0421	45.6005	46.3817	47.8227	47.7508	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	223.9644	198.2597	210.9038	185.7371	178.5977	159.3002	156.4598	164.0232	167.1496	187.7259	199.1535	221.5547 (62)
WWHRS	-24.4788	-21.6493	-22.6699	-18.7716	-17.4944	-14.9701	-14.0321	-14.9217	-15.4886	-18.2594	-20.6857	-24.0255 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
	199.4856	176.6104	188.2340	166.9656	161.1033	144.3301	142.4277	149.1015	151.6609	169.4665	178.4678	197.5292 (64)
										Total per year (kWh/year) = Sum(64)m =		2025.3825 (64)
12Total per year (kWh/year)												2025 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month												
	70.2641	62.1241	65.9214	57.6994	55.3378	49.2053	48.1964	50.5923	51.6378	58.2148	62.1500	69.4628 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.0079	85.2588	77.0079	79.5748	77.0079	79.5748	77.0079	77.0079	79.5748	77.0079	79.5748	77.0079	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)													
	94.4410	92.4465	88.6041	80.1381	74.3787	68.3407	64.7801	68.0005	71.7191	78.2456	86.3195	93.3640	(72)
Total internal gains													
	376.1109	383.9490	367.8698	353.4854	334.4478	317.9096	305.0567	306.6953	316.9668	332.4117	353.7638	368.3085	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.6400	11.2829	0.6300	0.7000	0.7700	29.7926	(75)
Southwest	2.4700	36.7938	0.6300	0.7000	0.7700	27.7743	(79)

Solar gains	57.5669	107.9536	173.9921	259.6427	331.0357	346.3307	326.5384	270.5718	203.2263	126.3989	70.7540	48.0992 (83)
Total gains	433.6778	491.9026	541.8619	613.1282	665.4835	664.2403	631.5951	577.2671	520.1931	458.8107	424.5178	416.4077 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.1915	55.3109	55.4285	55.9874	56.0932	56.5912	56.5912	56.6843	56.3983	56.0932	55.8795	55.6579	
alpha	4.6794	4.6874	4.6952	4.7325	4.7395	4.7727	4.7727	4.7790	4.7599	4.7395	4.7253	4.7105	
util living area													
	0.9920	0.9847	0.9673	0.9087	0.7794	0.5901	0.4393	0.4977	0.7528	0.9407	0.9845	0.9933	(86)
MIT	19.6607	19.8536	20.1490	20.5471	20.8377	20.9666	20.9933	20.9883	20.8981	20.5173	20.0263	19.6301	(87)
Th 2	19.8737	19.8758	19.8779	19.8878	19.8897	19.8984	19.8984	19.9000	19.8950	19.8897	19.8860	19.8820	(88)
util rest of house													
	0.9894	0.9797	0.9565	0.8796	0.7182	0.4988	0.3321	0.3837	0.6655	0.9152	0.9786	0.9912	(89)
MIT 2	18.3434	18.5891	18.9606	19.4470	19.7614	19.8808	19.8964	19.8962	19.8302	19.4259	18.8173	18.3103	(90)
Living area fraction										fLA = Living area / (4) =		0.4683	(91)
MIT	18.9603	19.1812	19.5171	19.9621	20.2654	20.3892	20.4101	20.4076	20.3303	19.9370	19.3834	18.9283	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9603	19.1812	19.5171	19.9621	20.2654	20.3892	20.4101	20.4076	20.3303	19.9370	19.3834	18.9283	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9865	0.9758	0.9522	0.8818	0.7403	0.5406	0.3824	0.4372	0.7023	0.9165	0.9751	0.9886	(94)
Useful gains	427.8237	479.9892	515.9592	540.6421	492.6861	359.0970	241.5461	252.3929	365.3526	420.4890	413.9646	411.6711	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	959.2040	932.3850	848.0513	713.4918	551.4154	369.4137	243.1225	255.3044	398.9161	601.0857	793.7926	955.5807	(97)

Space heating kWh
395.3469 304.0100 247.0765 124.4517 43.6946 0.0000 0.0000 0.0000 0.0000 134.3640 273.4762 404.6687 (98a)
Space heating requirement - total per year (kWh/year) 1927.0886
Solar heating kWh
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (98b)
Solar heating contribution - total per year (kWh/year) 0.0000
Space heating kWh
395.3469 304.0100 247.0765 124.4517 43.6946 0.0000 0.0000 0.0000 0.0000 134.3640 273.4762 404.6687 (98c)
Space heating requirement after solar contribution - total per year (kWh/year) 1927.0886
Space heating per m2 (98c) / (4) = 37.0594 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.4000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	395.3469	304.0100	247.0765	124.4517	43.6946	0.0000	0.0000	0.0000	0.0000	134.3640	273.4762	404.6687	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	427.8646	329.0152	267.3988	134.6880	47.2886	0.0000	0.0000	0.0000	0.0000	145.4155	295.9699	437.9532	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	199.4856	176.6104	188.2340	166.9656	161.1033	144.3301	142.4277	149.1015	151.6609	169.4665	178.4678	197.5292	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.8177	85.5338	84.9652	83.7604	81.9923	80.3000	80.3000	80.3000	80.3000	83.8888	85.2928	85.8830	(217)
Fuel for water heating, kWh/month													
	232.4528	206.4801	221.5424	199.3372	196.4859	179.7386	177.3695	185.6805	188.8679	202.0132	209.2413	229.9981	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.0007	12.8364	11.5577	8.4677	6.5407	5.3438	5.9666	7.7557	10.0738	13.2174	14.9290	16.4454	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.0683	-20.9172	-31.6975	-37.6496	-42.3904	-40.2476	-39.7772	-36.6675	-31.4861	-24.8082	-15.8531	-12.0411	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-4.9663	-10.6863	-21.6856	-33.2268	-44.5711	-44.9977	-44.4484	-37.3257	-26.9695	-15.4746	-6.6935	-3.9083	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 2085.5938 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 80.3000
Water heating fuel used 2429.2077 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
Total electricity for the above, kWh/year 86.0000 (231)
Electricity for lighting (calculated in Appendix L) 129.1350 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -642.5576 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 4087.3789 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2085.5938	0.2100	437.9747	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2429.2077	0.2100	510.1336	(264)

Space and water heating			948.1083 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	129.1350	0.1443	18.6382 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-347.6038	0.1335	-46.3925
PV Unit electricity exported	-294.9537	0.1253	-36.9657
Total			-83.3582 (269)
Total CO2, kg/year			895.3175 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.2200 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2085.5938	1.1300	2356.7210 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2429.2077	1.1300	2745.0047 (278)
Space and water heating			5101.7257 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	129.1350	1.5338	198.0716 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-347.6038	1.4932	-519.0405
PV Unit electricity exported	-294.9537	0.4600	-135.6819
Total			-654.7223 (283)
Total Primary energy kWh/year			4775.1757 (286)
Target Primary Energy Rate (TPER)			91.8300 (287)

Full SAP Calculation Printout

Property Reference	House - 10-12 Museum Street	Issued on Date	06/05/2023
Assessment Reference	00001	Prop Type Ref	House - 10-12 Museum Street
Property	Museum Street, London, WC1A		

SAP Rating	71 C	DER	29.41	TER	12.69
Environmental	70 C	% DER < TER			-131.76
CO_2 Emissions (t/year)	3.56	DFEE	98.63	TFEE	50.57
Compliance Check	See BREL	% DFEE < TFEE			-95.04
% DPER < TPER	-144.12	DPER	162.85	TPER	66.71

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	53.0000	(1a)	x 2.3600	(2a) =	125.0800	(1a) -
Ground floor	9.4400	(1b)	x 3.3700	(2b) =	31.8128	(1b) -
First floor	29.5700	(1c)	x 3.4400	(2c) =	101.7208	(1c) -
Second floor	29.5700	(1d)	x 3.0200	(2d) =	89.3014	(1d) -
Third floor	29.5700	(1e)	x 2.7000	(2e) =	79.8390	(1e) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	151.1500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		427.7540	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			No	
Pressure Test Method			Blower Door	
Measured/design AP50			15.0000	(17)
Infiltration rate			0.7500	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.5813	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.7411	0.7266	0.7120	0.6394	0.6248	0.5522	0.5522	0.5377	0.5813	0.6248	0.6539	0.6830	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	83.7000 (23c)

Effective ac	0.8226	0.8081	0.7935	0.7209	0.7063	0.6337	0.6337	0.6192	0.6627	0.7063	0.7354	0.7645	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Windows (Uw = 1.60)			32.9200	1.5038	49.5038			(27)
Solid Door			3.5900	3.0000	10.7700			(26)
Heatloss Floor 1			53.0000	0.2500	13.2500			(28)
External Wall 1	261.9900	36.5100	225.4800	0.3000	67.6440			(29a)
Sheltered Wall	52.9900		52.9900	0.3000	15.8970			(29a)
Flat Roof	32.9200		32.9200	0.1600	5.2672			(30)
Total net area of external elements Aum(A, m2)			400.9000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	162.3320			(33)
Party Wall 1			76.9300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		80.1800 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	242.5120 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	116.1164	114.0651	112.0139	101.7579	99.7067	89.4506	89.4506	87.3994	93.5530	99.7067	103.8091	107.9115	(38)
Heat transfer coeff	358.6283	356.5771	354.5259	344.2698	342.2186	331.9625	331.9625	329.9113	336.0650	342.2186	346.3210	350.4235	(39)
Average = Sum(39)m / 12 =												343.7570	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.3727	2.3591	2.3455	2.2777	2.2641	2.1962	2.1962	2.1827	2.2234	2.2641	2.2912	2.3184	(40)
HLP (average)												2.2743	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9360 (42)
Hot water usage for mixer showers	91.8080	90.4283	88.4178	84.5711	81.7323	78.5666	76.7671	78.7624	80.9496	84.3487	88.2780	91.4562 (42a)
Hot water usage for baths	33.3764	32.8807	32.1827	30.8956	29.9319	28.8633	28.2861	28.9792	29.7339	30.8774	32.1909	33.2636 (42b)
Hot water usage for other uses	47.0497	45.3388	43.6279	41.9170	40.2061	38.4952	38.4952	40.2061	41.9170	43.6279	45.3388	47.0497 (42c)
Average daily hot water use (litres/day)												158.3615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	172.2341	168.6478	164.2284	157.3838	151.8704	145.9251	143.5484	147.9478	152.6006	158.8540	165.8078	171.7695	(44)
Energy conte	272.7767	240.1523	252.4129	215.4505	204.4467	179.4319	173.6094	183.1902	188.1718	215.5634	236.2236	268.9496	(45)
Energy content (annual)										Total = Sum(45)m =		2630.3790	
Distribution loss (46)m = 0.15 x (45)m	40.9165	36.0228	37.8619	32.3176	30.6670	26.9148	26.0414	27.4785	28.2258	32.3345	35.4335	40.3424	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	323.7356	286.1797	303.3718	264.7656	255.4056	228.7470	224.5683	234.1491	237.4868	266.5223	285.5386	319.9085	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	323.7356	286.1797	303.3718	264.7656	255.4056	228.7470	224.5683	234.1491	237.4868	266.5223	285.5386	319.9085	(64)
										Total per year (kWh/year) = Sum(64)m =		3230.3790	(64)
12Total per year (kWh/year)												3230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	103.4380	91.3575	96.6670	83.9661	80.7183	71.9899	70.4649	73.6505	74.8959	84.4145	90.8731	102.1655	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.7984	146.7984	146.7984	146.7984	146.7984	146.7984	146.7984	146.7984	146.7984	146.7984	146.7984	146.7984	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	162.4115	179.8127	162.4115	167.8252	162.4115	167.8252	162.4115	162.4115	167.8252	162.4115	167.8252	162.4115	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	321.7707	325.1097	316.6956	298.7829	276.1714	254.9198	240.7225	237.3835	245.7976	263.7102	286.3217	307.5733	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6798	37.6798	37.6798	37.6798	37.6798	37.6798	37.6798	37.6798	37.6798	37.6798	37.6798	37.6798	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.4387	-117.4387	-117.4387	-117.4387	-117.4387	-117.4387	-117.4387	-117.4387	-117.4387	-117.4387	-117.4387	-117.4387	(71)
Water heating gains (Table 5)	139.0296	135.9486	129.9288	116.6195	108.4923	99.9859	94.7108	98.9926	104.0221	113.4604	126.2126	137.3192	(72)
Total internal gains	693.2513	710.9105	679.0754	653.2672	617.1147	589.7705	564.8843	565.8271	584.6844	609.6217	650.3991	677.3435	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	17.6800	11.2829	0.6300	0.7000	0.7700	60.9644 (75)
Southeast	5.7900	36.7938	0.6300	0.7000	0.7700	65.1067 (77)
Southwest	9.4500	36.7938	0.6300	0.7000	0.7700	106.2622 (79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	232.3332	415.9993	622.9759	862.0532	1047.8616	1076.4807	1022.7788	878.6236	704.8969	474.2704	281.9694	196.4426	(83)
Total gains	925.5845	1126.9099	1302.0513	1515.3204	1664.9763	1666.2512	1587.6631	1444.4507	1289.5813	1083.8920	932.3684	873.7861	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.2685	29.4369	29.6072	30.4892	30.6720	31.6196	31.6196	31.8162	31.2336	30.6720	30.3087	29.9538	
alpha	2.9512	2.9625	2.9738	3.0326	3.0448	3.1080	3.1080	3.1211	3.0822	3.0448	3.0206	2.9969	
util living area	0.9966	0.9935	0.9874	0.9699	0.9285	0.8395	0.7242	0.7757	0.9200	0.9812	0.9943	0.9972	(86)
MIT	18.0611	18.3141	18.7549	19.4138	20.0350	20.5676	20.8148	20.7629	20.3282	19.5287	18.7178	18.0669	(87)
Th 2	19.0965	19.1047	19.1129	19.1546	19.1631	19.2057	19.2057	19.2143	19.1886	19.1631	19.1462	19.1295	(88)
util rest of house	0.9952	0.9909	0.9818	0.9546	0.8850	0.7231	0.5039	0.5738	0.8494	0.9689	0.9916	0.9961	(89)
MIT 2	16.5528	16.8098	17.2532	17.9286	18.5261	19.0127	19.1670	19.1549	18.8239	18.0546	17.2395	16.5792	(90)
Living area fraction										fLA = Living area / (4) =		0.0864	(91)
MIT	16.6832	16.9398	17.3829	18.0569	18.6564	19.1470	19.3094	19.2938	18.9539	18.1819	17.3673	16.7077	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.6832	16.9398	17.3829	18.0569	18.6564	19.1470	19.3094	19.2938	18.9539	18.1819	17.3673	16.7077	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9922	0.9859	0.9734	0.9406	0.8676	0.7180	0.5200	0.5858	0.8355	0.9580	0.9870	0.9936	(94)
Useful gains	918.4094	1111.0250	1267.4794	1425.2917	1444.5773	1196.3448	825.5950	846.0984	1077.3882	1038.3159	920.2480	868.2067	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	4440.9544	4293.1171	3858.2869	3152.4475	2380.6250	1509.4483	899.4097	954.7014	1631.2118	2594.6782	3555.7679	4383.0067	(97)
Space heating kWh	2620.7735	2138.3659	1927.5608	1243.5522	696.4195	0.0000	0.0000	0.0000	0.0000	1157.9335	1897.5743	2615.0112	(98a)
Space heating requirement - total per year (kWh/year)												14297.1910	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	2620.7735	2138.3659	1927.5608	1243.5522	696.4195	0.0000	0.0000	0.0000	0.0000	1157.9335	1897.5743	2615.0112	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												14297.1910	
Space heating per m2											(98c) / (4) =	94.5894	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	84.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	2620.7735	2138.3659	1927.5608	1243.5522	696.4195	0.0000	0.0000	0.0000	0.0000	1157.9335	1897.5743	2615.0112	(98)
Space heating efficiency (main heating system 1)	84.4000	84.4000	84.4000	84.4000	84.4000	0.0000	0.0000	0.0000	0.0000	84.4000	84.4000	84.4000	(210)
Space heating fuel (main heating system)	3105.1819	2533.6089	2283.8398	1473.4031	825.1416	0.0000	0.0000	0.0000	0.0000	1371.9592	2248.3108	3098.3545	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	323.7356	286.1797	303.3718	264.7656	255.4056	228.7470	224.5683	234.1491	237.4868	266.5223	285.5386	319.9085	(64)
Efficiency of water heater												89.4000	(216)
(217)m	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	(217)
Fuel for water heating, kWh/month													

	362.1204	320.1115	339.3421	296.1584	285.6886	255.8691	251.1950	261.9118	265.6452	298.1234	319.3944	357.8394 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	54.0199	48.7921	54.0199	52.2773	54.0199	52.2773	54.0199	54.0199	52.2773	54.0199	52.2773	54.0199 (231)
Lighting	34.5276	27.6993	24.9402	18.2722	14.1140	11.5313	12.8753	16.7358	21.7381	28.5216	32.2150	35.4872 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	16939.7997 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	89.4000
Water heating fuel used	3613.3993 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.7000, SFP = 1.0540)	
mechanical ventilation fans (SFP = 1.0540)	550.0403 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	636.0403 (231)
Electricity for lighting (calculated in Appendix L)	278.6576 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	21467.8969 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	16939.7997	0.2100	3557.3579	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3613.3993	0.2100	758.8138	(264)
Space and water heating			4316.1718	(265)
Pumps, fans and electric keep-hot	636.0403	0.1387	88.2266	(267)
Energy for lighting	278.6576	0.1443	40.2189	(268)
Total CO2, kg/year			4444.6173	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			29.4100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	16939.7997	1.1300	19141.9737	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3613.3993	1.1300	4083.1412	(278)
Space and water heating			23225.1149	(279)
Pumps, fans and electric keep-hot	636.0403	1.5128	962.2018	(281)
Energy for lighting	278.6576	1.5338	427.4144	(282)
Total Primary energy kWh/year			24614.7310	(286)
Dwelling Primary energy Rate (DPER)			162.8500	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	53.0000 (1a)	x	2.3600 (2a)	=	125.0800 (1a)	-
Ground floor	9.4400 (1b)	x	3.3700 (2b)	=	31.8128 (1b)	-
First floor	29.5700 (1c)	x	3.4400 (2c)	=	101.7208 (1c)	-
Second floor	29.5700 (1d)	x	3.0200 (2d)	=	89.3014 (1d)	-
Third floor	29.5700 (1e)	x	2.7000 (2e)	=	79.8390 (1e)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	151.1500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	427.7540 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0935 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3435 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2662 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3394	0.3328	0.3261	0.2928	0.2862	0.2529	0.2529	0.2463	0.2662	0.2862	0.2995	0.3128	(22b)
Effective ac	0.5576	0.5554	0.5532	0.5429	0.5410	0.5320	0.5320	0.5303	0.5354	0.5410	0.5448	0.5489	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			3.5900	1.0000	3.5900			(26)
TER Opening Type (Uw = 1.20)			32.9200	1.1450	37.6947			(27)
Heatloss Floor 1			53.0000	0.1300	6.8900			(28)
External Wall 1	261.9900	36.5100	225.4800	0.1800	40.5864			(29a)
Sheltered Wall	52.9900		52.9900	0.1800	9.5382			(29a)
Flat Roof	32.9200		32.9200	0.1100	3.6212			(30)
Total net area of external elements Aum(A, m2)			400.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		101.9205			(33)
Party Wall 1			76.9300	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)							20.0450	(36)
Point Thermal bridges					(36a) =		0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		121.9655	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	78.7112	78.3954	78.0859	76.6321	76.3601	75.0939	75.0939	74.8595	75.5816	76.3601	76.9104	77.4856	(38)
Heat transfer coeff	200.6766	200.3609	200.0514	198.5976	198.3256	197.0594	197.0594	196.8249	197.5471	198.3256	198.8758	199.4511	(39)
Average = Sum(39)m / 12 =												198.5963	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3277	1.3256	1.3235	1.3139	1.3121	1.3037	1.3037	1.3022	1.3070	1.3121	1.3158	1.3196	(40)
HLP (average)												1.3139	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9360 (42)
Hot water usage for mixer showers	73.4464	72.3426	70.7342	67.6569	65.3859	62.8532	61.4137	63.0099	64.7597	67.4789	70.6224	73.1650 (42a)
Hot water usage for baths	31.7076	31.2367	30.5735	29.3508	28.4353	27.4201	26.8718	27.5303	28.2472	29.3335	30.5814	31.6004 (42b)
Hot water usage for other uses												

	44.6973	43.0719	41.4465	39.8212	38.1958	36.5705	36.5705	38.1958	39.8212	41.4465	43.0719	44.6973	(42c)
Average daily hot water use (litres/day)												137.7469	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	149.8512	146.6512	142.7543	136.8289	132.0170	126.8438	124.8560	128.7360	132.8281	138.2590	144.2757	149.4626	(44)
Energy conte	237.3277	208.8293	219.4081	187.3119	177.7203	155.9693	151.0025	159.4021	163.7903	187.6162	205.5472	234.0223	(45)
Energy content (annual)											Total = Sum(45)m =	2287.9471	
Distribution loss (46)m = 0.15 x (45)m													
	35.5992	31.3244	32.9112	28.0968	26.6580	23.3954	22.6504	23.9103	24.5685	28.1424	30.8321	35.1033	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	288.2866	254.8567	270.3670	236.6270	228.6792	205.2844	201.9614	210.3610	213.1054	238.5751	254.8622	284.9812	(62)
WWHRS	-33.5766	-29.6954	-31.0953	-25.7482	-23.9964	-20.5339	-19.2472	-20.4675	-21.2451	-25.0457	-28.3737	-32.9548	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	254.7100	225.1613	239.2716	210.8788	204.6828	184.7505	182.7141	189.8935	191.8603	213.5294	226.4885	252.0264	(64)
											Total per year (kWh/year) = Sum(64)m =	2575.9672	(64)
12Total per year (kWh/year)												2576	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	91.6512	80.9426	85.6929	74.6100	71.8317	64.1886	62.9480	65.7409	66.7891	75.1221	80.6732	90.5521	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	146.7984	146.7984	146.7984	146.7984	146.7984	146.7984	146.7984	146.7984	146.7984	146.7984	146.7984	146.7984	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	162.4115	179.8127	162.4115	167.8252	162.4115	167.8252	162.4115	162.4115	167.8252	162.4115	167.8252	162.4115	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	321.7707	325.1097	316.6956	298.7829	276.1714	254.9198	240.7225	237.3835	245.7976	263.7102	286.3217	307.5733	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.6798	37.6798	37.6798	37.6798	37.6798	37.6798	37.6798	37.6798	37.6798	37.6798	37.6798	37.6798	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-117.4387	-117.4387	-117.4387	-117.4387	-117.4387	-117.4387	-117.4387	-117.4387	-117.4387	-117.4387	-117.4387	-117.4387	(71)
Water heating gains (Table 5)													
	123.1871	120.4503	115.1786	103.6250	96.5480	89.1508	84.6076	88.3614	92.7626	100.9706	112.0461	121.7099	(72)
Total internal gains													
	677.4088	695.4122	664.3252	640.2726	605.1705	578.9354	554.7811	555.1960	573.4249	597.1318	636.2325	661.7342	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	17.6800	11.2829	0.6300	0.7000	0.7700	60.9644	(75)
Southeast	5.7900	36.7938	0.6300	0.7000	0.7700	65.1067	(77)
Southwest	9.4500	36.7938	0.6300	0.7000	0.7700	106.2622	(79)

Solar gains	232.3332	415.9993	622.9759	862.0532	1047.8616	1076.4807	1022.7788	878.6236	704.8969	474.2704	281.9694	196.4426	(83)
Total gains	909.7420	1111.4116	1287.3011	1502.3259	1653.0320	1655.4160	1577.5599	1433.8196	1278.3218	1071.4022	918.2019	858.1768	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.3057	52.3881	52.4692	52.8533	52.9257	53.2658	53.2658	53.3293	53.1343	52.9257	52.7793	52.6271	
alpha	4.4870	4.4925	4.4979	4.5236	4.5284	4.5511	4.5511	4.5553	4.5423	4.5284	4.5186	4.5085	
util living area													
	0.9979	0.9945	0.9854	0.9516	0.8609	0.6943	0.5328	0.6004	0.8448	0.9746	0.9954	0.9984	(86)
MIT	19.3214	19.5427	19.8779	20.3297	20.7098	20.9229	20.9817	20.9692	20.8048	20.2984	19.7261	19.2842	(87)
Th 2	19.8192	19.8209	19.8224	19.8300	19.8314	19.8379	19.8379	19.8391	19.8354	19.8314	19.8285	19.8255	(88)
util rest of house													
	0.9972	0.9926	0.9800	0.9330	0.8088	0.5940	0.4005	0.4638	0.7669	0.9613	0.9935	0.9978	(89)
MIT 2	17.8735	18.1574	18.5843	19.1504	19.5877	19.7947	19.8324	19.8286	19.7003	19.1235	18.3981	17.8303	(90)
Living area fraction										fLA = Living area / (4) =		0.0864	(91)
MIT	17.9986	18.2771	18.6961	19.2523	19.6847	19.8922	19.9317	19.9272	19.7958	19.2250	18.5129	17.9559	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9986	18.2771	18.6961	19.2523	19.6847	19.8922	19.9317	19.9272	19.7958	19.2250	18.5129	17.9559	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9953	0.9887	0.9726	0.9209	0.8011	0.5991	0.4116	0.4748	0.7637	0.9514	0.9900	0.9964	(94)
Useful gains	905.4717	1098.8441	1251.9752	1383.4391	1324.2459	991.8293	649.3957	680.8378	976.2602	1019.3649	908.9816	855.0454	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	2748.9982	2680.2400	2439.8373	2055.9328	1583.5663	1042.8720	656.5442	694.2323	1125.1794	1710.5568	2269.7483	2743.6279	(97)
Space heating kWh	1371.5837	1062.6981	883.7693	484.1954	192.9344	0.0000	0.0000	0.0000	0.0000	514.2467	979.7520	1405.1054	(98a)
Space heating requirement - total per year (kWh/year)												6894.2852	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	1371.5837	1062.6981	883.7693	484.1954	192.9344	0.0000	0.0000	0.0000	0.0000	514.2467	979.7520	1405.1054	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6894.2852	
Space heating per m2											(98c) / (4) =	45.6122	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1371.5837	1062.6981	883.7693	484.1954	192.9344	0.0000	0.0000	0.0000	0.0000	514.2467	979.7520	1405.1054	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	1484.3980	1150.1062	956.4603	524.0210	208.8035	0.0000	0.0000	0.0000	0.0000	556.5441	1060.3377	1520.6768	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	254.7100	225.1613	239.2716	210.8788	204.6828	184.7505	182.7141	189.8935	191.8603	213.5294	226.4885	252.0264	(64)
Efficiency of water heater												80.3000	(216)
(217)m	87.4334	87.2660	86.9167	86.1023	84.2549	80.3000	80.3000	80.3000	80.3000	86.1916	87.1475	87.4752	(217)
Fuel for water heating, kWh/month	291.3188	258.0172	275.2883	244.9166	242.9328	230.0754	227.5394	236.4801	238.9293	247.7380	259.8909	288.1119	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	33.7459	27.0722	24.3755	17.8586	13.7945	11.2702	12.5838	16.3569	21.2459	27.8758	31.4857	34.6838	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-50.2312	-71.1561	-102.7378	-115.9942	-125.3966	-117.0489	-115.4873	-108.8025	-97.1640	-81.4597	-55.2984	-43.3785	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-27.3713	-57.6893	-114.9009	-172.9634	-229.1387	-230.4897	-227.8937	-192.8618	-141.1550	-82.7701	-36.6225	-21.6461	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	7461.3476	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	3041.2386	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	272.3487	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2619.6578	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)

Energy used		0.0000 (237)
Total delivered energy for all uses		8241.2771 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	7461.3476	0.2100	1566.8830	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3041.2386	0.2100	638.6601	(264)
Space and water heating			2205.5431	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	272.3487	0.1443	39.3083	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1084.1552	0.1345	-145.8352	
PV Unit electricity exported	-1535.5026	0.1258	-193.1928	
Total			-339.0280	(269)
Total CO2, kg/year			1917.7527	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.6900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	7461.3476	1.1300	8431.3228	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3041.2386	1.1300	3436.5996	(278)
Space and water heating			11867.9224	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	272.3487	1.5338	417.7376	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1084.1552	1.4971	-1623.1334	
PV Unit electricity exported	-1535.5026	0.4618	-709.1431	
Total			-2332.2765	(283)
Total Primary energy kWh/year			10083.4843	(286)
Target Primary Energy Rate (TPER)			66.7100	(287)

Full SAP Calculation Printout

Property Reference	House - 35 New Oxford Street	Issued on Date	06/05/2023
Assessment Reference	00001	Prop Type Ref	House - 10-12 Museum Street
Property	Museum Street, London, WC1A		

SAP Rating	74 C	DER	26.03	TER	14.01
Environmental	76 C	% DER < TER			-85.80
CO_2 Emissions (t/year)	2.13	DFEE	79.08	TFEE	39.83
Compliance Check	See BREL	% DFEE < TFEE			-98.54
% DPER < TPER	-90.52	DPER	145.38	TPER	76.31

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		5.4400 (1b)	x	3.1600 (2b)	=	17.1904 (1b)	-
First floor		33.0000 (1c)	x	3.2500 (2c)	=	107.2500 (1c)	-
Second floor		31.0000 (1d)	x	3.0400 (2d)	=	94.2400 (1d)	-
Third floor		34.0000 (1e)	x	2.8400 (2e)	=	96.5600 (1e)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.4400						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	315.2404	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.7500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5813	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.7411	0.7266	0.7120	0.6394	0.6248	0.5522	0.5522	0.5377	0.5813	0.6248	0.6539	0.6830	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	83.7000	(23c)

Effective ac	0.8226	0.8081	0.7935	0.7209	0.7063	0.6337	0.6337	0.6192	0.6627	0.7063	0.7354	0.7645	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K

Windows (Uw = 1.60)			20.0700	1.5038	30.1805	(27)
Solid Door			1.7900	3.0000	5.3700	(26)
Opening			1.0800	1.5038	1.6241	(27a)
GF			5.4400	0.2500	1.3600	(28a)
1F			27.5600	0.2500	6.8900	(28b)
External Wall 1	70.0600	21.8600	48.2000	0.3000	14.4600	(29a)
Sheltered Wall	41.0800		41.0800	0.3000	12.3240	(29a)
Flat Roof	34.0000	1.0800	32.9200	0.1600	5.2672	(30)
Total net area of external elements Aum(A, m2)			178.1400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		77.4757	(33)
Party Wall 1			170.3700	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		35.6280 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	113.1037 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	85.5739	84.0622	82.5505	74.9921	73.4805	65.9221	65.9221	64.4104	68.9454	73.4805	76.5038	79.5272	(38)
Heat transfer coeff	198.6776	197.1659	195.6542	188.0959	186.5842	179.0258	179.0258	177.5141	182.0492	186.5842	189.6075	192.6309	(39)
Average = Sum(39)m / 12 =												187.7179	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9207	1.9061	1.8915	1.8184	1.8038	1.7307	1.7307	1.7161	1.7599	1.8038	1.8330	1.8622	(40)
HLP (average)												1.8148	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7692 (42)
Hot water usage for mixer showers	88.3121	86.9849	85.0510	81.3508	78.6201	75.5749	73.8440	75.7633	77.8672	81.1368	84.9165	87.9737 (42a)
Hot water usage for baths	30.5049	30.0519	29.4139	28.2376	27.3568	26.3801	25.8525	26.4860	27.1758	28.2209	29.4214	30.4018 (42b)
Hot water usage for other uses	42.9891	41.4258	39.8626	38.2994	36.7361	35.1729	35.1729	36.7361	38.2994	39.8626	41.4258	42.9891 (42c)
Average daily hot water use (litres/day)												148.7846 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	161.8061	158.4626	154.3275	147.8877	142.7130	137.1278	134.8694	138.9854	143.3423	149.2203	155.7638	161.3646	(44)
Energy conte	256.2613	225.6487	237.1956	202.4509	192.1191	168.6147	163.1128	172.0930	176.7554	202.4906	221.9141	252.6579	(45)
Energy content (annual)										Total = Sum(45)m =		2471.3140	
Distribution loss (46)m = 0.15 x (45)m	38.4392	33.8473	35.5793	30.3676	28.8179	25.2922	24.4669	25.8139	26.5133	30.3736	33.2871	37.8987	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	307.2202	271.6761	288.1545	251.7659	243.0780	217.9297	214.0717	223.0519	226.0705	253.4495	271.2291	303.6168	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	307.2202	271.6761	288.1545	251.7659	243.0780	217.9297	214.0717	223.0519	226.0705	253.4495	271.2291	303.6168	(64)
									Total per year (kWh/year) = Sum(64)m =			3071.3140	(64)
12Total per year (kWh/year)												3071	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	97.9466	86.5350	91.6073	79.6437	76.6193	68.3931	66.9747	69.9606	71.1000	80.0678	86.1152	96.7485	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.4585	138.4585	138.4585	138.4585	138.4585	138.4585	138.4585	138.4585	138.4585	138.4585	138.4585	138.4585	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.5607	146.7637	132.5607	136.9794	132.5607	136.9794	132.5607	132.5607	136.9794	132.5607	136.9794	132.5607	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	261.7720	264.4884	257.6432	243.0707	224.6754	207.3865	195.8364	193.1200	199.9652	214.5378	232.9330	250.2220	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8459	36.8459	36.8459	36.8459	36.8459	36.8459	36.8459	36.8459	36.8459	36.8459	36.8459	36.8459	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-110.7668	-110.7668	-110.7668	-110.7668	-110.7668	-110.7668	-110.7668	-110.7668	-110.7668	-110.7668	-110.7668	-110.7668	(71)
Water heating gains (Table 5)	131.6486	128.7724	123.1280	110.6162	102.9830	94.9905	90.0198	94.0331	98.7499	107.6181	119.6044	130.0383	(72)
Total internal gains	593.5190	607.5620	580.8695	558.2039	527.7567	503.8939	482.9545	484.2514	500.2321	522.2541	557.0544	580.3585	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	14.2800	10.6334	0.6300	0.7000	0.7700	46.4058 (74)
Southeast	5.7900	36.7938	0.6300	0.7000	0.7700	65.1067 (77)
South	1.0800	26.0000	0.6300	0.7000	1.0000	11.1450 (82)

Solar gains	122.6574	222.7317	343.5852	494.3655	618.9614	643.8655	608.4777	510.5774	394.7812	256.4264	149.3758	103.4056 (83)
Total gains	716.1763	830.2937	924.4548	1052.5694	1146.7181	1147.7594	1091.4322	994.8288	895.0133	778.6805	706.4302	683.7641 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.1557	36.4329	36.7144	38.1897	38.4992	40.1246	40.1246	40.4663	39.4582	38.4992	37.8853	37.2907	
alpha	3.4104	3.4289	3.4476	3.5460	3.5666	3.6750	3.6750	3.6978	3.6305	3.5666	3.5257	3.4860	
util living area	0.9958	0.9925	0.9858	0.9640	0.9088	0.7854	0.6443	0.7036	0.8939	0.9766	0.9929	0.9965	(86)
MIT	18.6329	18.8592	19.2418	19.8348	20.3582	20.7710	20.9208	20.8904	20.5746	19.9072	19.2174	18.6564	(87)
Th 2	19.3867	19.3967	19.4067	19.4571	19.4673	19.5189	19.5189	19.5293	19.4982	19.4673	19.4470	19.4267	(88)
util rest of house	0.9942	0.9897	0.9799	0.9476	0.8621	0.6723	0.4616	0.5278	0.8191	0.9628	0.9897	0.9952	(89)
MIT 2	17.3099	17.5417	17.9282	18.5441	19.0407	19.4167	19.5013	19.5007	19.2653	18.6295	17.9337	17.3603	(90)
Living area fraction										fLA = Living area / (4) =		0.1322	(91)
MIT	17.4847	17.7158	18.1018	18.7146	19.2148	19.5957	19.6889	19.6844	19.4384	18.7983	18.1033	17.5316	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4847	17.7158	18.1018	18.7146	19.2148	19.5957	19.6889	19.6844	19.4384	18.7983	18.1033	17.5316	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9913	0.9851	0.9727	0.9364	0.8520	0.6793	0.4852	0.5494	0.8151	0.9537	0.9854	0.9927	(94)
Useful gains	709.9100	817.9329	899.2317	985.6603	977.0160	779.6912	529.5911	546.6073	729.5270	742.6324	696.0881	678.7734	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	2619.5120	2526.8371	2269.9387	1846.0911	1402.1521	894.3624	552.9897	583.0267	971.8466	1529.6790	2086.3174	2568.0830	(97)
Space heating kWh	1420.7439	1148.3836	1019.8060	619.5102	316.3013	0.0000	0.0000	0.0000	0.0000	585.5627	1000.9650	1405.6463	(98a)
Space heating requirement - total per year (kWh/year)												7516.9190	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	1420.7439	1148.3836	1019.8060	619.5102	316.3013	0.0000	0.0000	0.0000	0.0000	585.5627	1000.9650	1405.6463	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7516.9190	
Space heating per m2											(98c) / (4) =	72.6694	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	84.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1420.7439	1148.3836	1019.8060	619.5102	316.3013	0.0000	0.0000	0.0000	0.0000	585.5627	1000.9650	1405.6463	(98)
Space heating efficiency (main heating system 1)	84.4000	84.4000	84.4000	84.4000	84.4000	0.0000	0.0000	0.0000	0.0000	84.4000	84.4000	84.4000	(210)
Space heating fuel (main heating system)	1683.3458	1360.6441	1208.3009	734.0168	374.7645	0.0000	0.0000	0.0000	0.0000	693.7946	1185.9775	1665.4577	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement	307.2202	271.6761	288.1545	251.7659	243.0780	217.9297	214.0717	223.0519	226.0705	253.4495	271.2291	303.6168	(64)
Efficiency of water heater												89.4000	(216)
(217)m	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	(217)

Fuel for water heating, kWh/month

	343.6467	303.8882	322.3205	281.6174	271.8993	243.7693	239.4538	249.4988	252.8753	283.5005	303.3883	339.6161 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	41.7321	37.6935	41.7321	40.3859	41.7321	40.3859	41.7321	41.7321	40.3859	41.7321	40.3859	41.7321 (231)
Lighting	28.1815	22.6083	20.3562	14.9139	11.5199	9.4119	10.5088	13.6598	17.7427	23.2794	26.2940	28.9648 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	8906.3021 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	89.4000
Water heating fuel used	3435.4742 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.7000, SFP = 1.0540)	
mechanical ventilation fans (SFP = 1.0540)	405.3613 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	491.3613 (231)
Electricity for lighting (calculated in Appendix L)	227.4412 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	13060.5788 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	8906.3021	0.2100	1870.3234	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3435.4742	0.2100	721.4496	(264)
Space and water heating			2591.7730	(265)
Pumps, fans and electric keep-hot	491.3613	0.1387	68.1579	(267)
Energy for lighting	227.4412	0.1443	32.8268	(268)
Total CO2, kg/year			2692.7577	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			26.0300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	8906.3021	1.1300	10064.1214	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3435.4742	1.1300	3882.0859	(278)
Space and water heating			13946.2073	(279)
Pumps, fans and electric keep-hot	491.3613	1.5128	743.3314	(281)
Energy for lighting	227.4412	1.5338	348.8568	(282)
Total Primary energy kWh/year			15038.3955	(286)
Dwelling Primary energy Rate (DPER)			145.3800	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	5.4400 (1b)	x	3.1600 (2b)	=	17.1904 (1b)	-
First floor	33.0000 (1c)	x	3.2500 (2c)	=	107.2500 (1c)	-
Second floor	31.0000 (1d)	x	3.0400 (2d)	=	94.2400 (1d)	-
Third floor	34.0000 (1e)	x	2.8400 (2e)	=	96.5600 (1e)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.4400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	315.2404	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1269	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3769	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2921	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3724	0.3651	0.3578	0.3213	0.3140	0.2775	0.2775	0.2702	0.2921	0.3140	0.3286	0.3432	(22b)
Effective ac	0.5693	0.5667	0.5640	0.5516	0.5493	0.5385	0.5385	0.5365	0.5427	0.5493	0.5540	0.5589	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type (Uw = 1.20)			20.0700	1.1450	22.9809			(27)
Opening			1.0800	1.5918	1.7191			(27a)
GF			5.4400	0.1300	0.7072			(28a)
1F			27.5600	0.1300	3.5828			(28b)
External Wall 1	70.0600	21.8600	48.2000	0.1800	8.6760			(29a)
Sheltered Wall	41.0800		41.0800	0.1800	7.3944			(29a)
Flat Roof	34.0000	1.0800	32.9200	0.1100	3.6212			(30)
Total net area of external elements Aum(A, m2)			178.1400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.4716			(33)
Party Wall 1			170.3700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	8.9070	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 59.3786	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	59.2286	58.9485	58.6739	57.3842	57.1429	56.0196	56.0196	55.8116	56.4523	57.1429	57.6311	58.1414	(38)
Heat transfer coeff	118.6072	118.3271	118.0525	116.7628	116.5215	115.3983	115.3983	115.1902	115.8309	116.5215	117.0097	117.5200	(39)
Average = Sum(39)m / 12 =												116.7617	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1466	1.1439	1.1413	1.1288	1.1265	1.1156	1.1156	1.1136	1.1198	1.1265	1.1312	1.1361	(40)
HLP (average)												1.1288	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7692	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
70.6497	69.5880	68.0408	65.0806	62.8961	60.4599	59.0752	60.6106	62.2937	64.9095	67.9332	70.3790	(42a)

Hot water usage for baths

	30.5049	30.0519	29.4139	28.2376	27.3568	26.3801	25.8525	26.4860	27.1758	28.2209	29.4214	30.4018 (42b)
Hot water usage for other uses												
	42.9891	41.4258	39.8626	38.2994	36.7361	35.1729	35.1729	36.7361	38.2994	39.8626	41.4258	42.9891 (42c)
Average daily hot water use (litres/day)												132.5005 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	144.1436	141.0656	137.3173	131.6175	126.9890	122.0129	120.1006	123.8328	127.7689	132.9929	138.7805	143.7698	(44)
Energy conte	228.2883	200.8756	211.0515	180.1778	170.9515	150.0290	145.2512	153.3308	157.5518	180.4702	197.7182	225.1088	(45)
Energy content (annual)										Total = Sum(45)m =		2200.8050	
Distribution loss (46)m = 0.15 x (45)m													
	34.2432	30.1313	31.6577	27.0267	25.6427	22.5044	21.7877	22.9996	23.6328	27.0705	29.6577	33.7663	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	279.2472	246.9030	262.0104	229.4929	221.9104	199.3441	196.2101	204.2897	206.8669	231.4291	247.0333	276.0677	(62)
WWHRS	-32.2981	-28.5647	-29.9113	-24.7677	-23.0826	-19.7520	-18.5143	-19.6881	-20.4362	-24.0920	-27.2933	-31.7000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	246.9491	218.3383	232.0992	204.7252	198.8278	179.5921	177.6958	184.6016	186.4308	207.3371	219.7400	244.3677	(64)
										Total per year (kWh/year) = Sum(64)m =		2500.7047	(64)
12Total per year (kWh/year)												2501	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	88.6456	78.2980	82.9144	72.2379	69.5811	62.2134	61.0358	63.7222	64.7148	72.7461	78.0701	87.5884	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.4585	138.4585	138.4585	138.4585	138.4585	138.4585	138.4585	138.4585	138.4585	138.4585	138.4585	138.4585	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	132.5607	146.7637	132.5607	136.9794	132.5607	136.9794	132.5607	132.5607	136.9794	132.5607	136.9794	132.5607	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	261.7720	264.4884	257.6432	243.0707	224.6754	207.3865	195.8364	193.1200	199.9652	214.5378	232.9330	250.2220	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.8459	36.8459	36.8459	36.8459	36.8459	36.8459	36.8459	36.8459	36.8459	36.8459	36.8459	36.8459	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-110.7668	-110.7668	-110.7668	-110.7668	-110.7668	-110.7668	-110.7668	-110.7668	-110.7668	-110.7668	-110.7668	-110.7668	(71)
Water heating gains (Table 5)													
	119.1473	116.5149	111.4440	100.3304	93.5230	86.4075	82.0373	85.6482	89.8816	97.7770	108.4307	117.7264	(72)
Total internal gains													
	581.0176	595.3045	569.1856	547.9180	518.2967	495.3110	474.9720	475.8665	491.3638	512.4130	545.8807	568.0466	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	14.2800	10.6334	0.6300	0.7000	0.7700	46.4058	(74)
Southeast	5.7900	36.7938	0.6300	0.7000	0.7700	65.1067	(77)
South	1.0800	26.0000	0.6300	0.7000	1.0000	11.1450	(82)

Solar gains	122.6574	222.7317	343.5852	494.3655	618.9614	643.8655	608.4777	510.5774	394.7812	256.4264	149.3758	103.4056	(83)
Total gains	703.6750	818.0362	912.7708	1042.2836	1137.2581	1139.1764	1083.4497	986.4438	886.1449	768.8394	695.2564	671.4521	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.5640	60.7074	60.8486	61.5207	61.6481	62.2482	62.2482	62.3606	62.0157	61.6481	61.3909	61.1243	
alpha	5.0376	5.0472	5.0566	5.1014	5.1099	5.1499	5.1499	5.1574	5.1344	5.1099	5.0927	5.0750	
util living area													
	0.9965	0.9919	0.9801	0.9341	0.8155	0.6220	0.4636	0.5268	0.7909	0.9619	0.9924	0.9972	(86)
MIT	19.6732	19.8654	20.1519	20.5431	20.8374	20.9688	20.9943	20.9894	20.8975	20.5085	20.0262	19.6444	(87)
Th 2	19.9629	19.9651	19.9673	19.9774	19.9793	19.9881	19.9881	19.9897	19.9847	19.9793	19.9754	19.9714	(88)
util rest of house													
	0.9953	0.9893	0.9733	0.9118	0.7607	0.5346	0.3597	0.4164	0.7115	0.9444	0.9894	0.9963	(89)
MIT 2	18.4229	18.6694	19.0330	19.5194	19.8463	19.9710	19.9863	19.9861	19.9164	19.4894	18.8831	18.3923	(90)
Living area fraction										fLA = Living area / (4) =		0.1322	(91)
MIT	18.5882	18.8274	19.1809	19.6547	19.9773	20.1028	20.1195	20.1187	20.0460	19.6240	19.0341	18.5578	(92)

Temperature adjustment												0.0000	
adjusted MIT	18.5882	18.8274	19.1809	19.6547	19.9773	20.1028	20.1195	20.1187	20.0460	19.6240	19.0341	18.5578	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9930	0.9851	0.9663	0.9032	0.7606	0.5449	0.3734	0.4309	0.7169	0.9363	0.9854	0.9944	(94)
Useful gains	698.7366	805.8478	882.0441	941.4395	865.0052	620.7682	404.5235	425.0556	635.2741	719.8764	685.0993	667.6734	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1694.6796	1647.9907	1497.0124	1255.7517	964.4809	635.0178	406.1499	428.3567	688.7328	1051.4959	1396.4086	1687.3285	(97)
Space heating kWh	740.9817	565.9200	457.5364	226.3048	74.0099	0.0000	0.0000	0.0000	0.0000	246.7250	512.1427	758.6234	(98a)
Space heating requirement - total per year (kWh/year)												3582.2438	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	740.9817	565.9200	457.5364	226.3048	74.0099	0.0000	0.0000	0.0000	0.0000	246.7250	512.1427	758.6234	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3582.2438	
Space heating per m2											(98c) / (4) =	34.6311	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	740.9817	565.9200	457.5364	226.3048	74.0099	0.0000	0.0000	0.0000	0.0000	246.7250	512.1427	758.6234	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	801.9282	612.4675	495.1693	244.9186	80.0973	0.0000	0.0000	0.0000	0.0000	267.0184	554.2670	821.0210	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	246.9491	218.3383	232.0992	204.7252	198.8278	179.5921	177.6958	184.6016	186.4308	207.3371	219.7400	244.3677	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.5821	86.3261	85.8071	84.5967	82.4639	80.3000	80.3000	80.3000	80.3000	84.7551	86.1305	86.6393	(217)
Fuel for water heating, kWh/month	285.2196	252.9228	270.4893	242.0013	241.1088	223.6515	221.2899	229.8899	232.1678	244.6307	255.1246	282.0519	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.5435	22.0964	19.8954	14.5762	11.2591	9.1988	10.2709	13.3505	17.3410	22.7523	25.6987	28.3090	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-6.8558	-10.7763	-17.2449	-21.6546	-25.4404	-24.5272	-24.2260	-21.8010	-17.9627	-13.2405	-7.9192	-5.8048	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.1095	-2.4486	-5.0939	-8.0045	-10.9496	-11.1447	-11.0192	-9.1623	-6.4987	-3.6163	-1.5157	-0.8694	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3876.8872	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2980.5481	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												222.2918	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-268.8856	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)

Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	6896.8415 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3876.8872	0.2100	814.1463	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2980.5481	0.2100	625.9151	(264)
Space and water heating			1440.0614	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	222.2918	0.1443	32.0836	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-197.4534	0.1324	-26.1431	
PV Unit electricity exported	-71.4322	0.1246	-8.8998	
Total			-35.0429	(269)
Total CO2, kg/year			1449.0313	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.0100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3876.8872	1.1300	4380.8825	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2980.5481	1.1300	3368.0194	(278)
Space and water heating			7748.9019	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	222.2918	1.5338	340.9586	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-197.4534	1.4892	-294.0489	
PV Unit electricity exported	-71.4322	0.4573	-32.6637	
Total			-326.7126	(283)
Total Primary energy kWh/year			7893.2487	(286)
Target Primary Energy Rate (TPER)			76.3100	(287)

Full SAP Calculation Printout

Property Reference	House - 37 New Oxford Street	Issued on Date	06/05/2023
Assessment Reference	00001	Prop Type Ref	House - 10-12 Museum Street
Property	Museum Street, London, WC1A		

SAP Rating	75 C	DER	23.28	TER	12.31
Environmental	77 C	% DER < TER			-89.11
CO_2 Emissions (t/year)	2.5	DFEE	72.62	TFEE	37.19
Compliance Check	See BREL	% DFEE < TFEE			-95.27
% DPER < TPER	-94.32	DPER	130.48	TPER	67.15

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		5.4400 (1b)	x	3.1600 (2b)	=	17.1904 (1b)	-
First floor		44.0000 (1c)	x	3.2500 (2c)	=	143.0000 (1c)	-
Second floor		44.0000 (1d)	x	3.0400 (2d)	=	133.7600 (1d)	-
Third floor		44.0000 (1e)	x	2.8400 (2e)	=	124.9600 (1e)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.4400						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	418.9104	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.7500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5813	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.7411	0.7266	0.7120	0.6394	0.6248	0.5522	0.5522	0.5377	0.5813	0.6248	0.6539	0.6830	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	83.7000 (23c)

Effective ac	0.8226	0.8081	0.7935	0.7209	0.7063	0.6337	0.6337	0.6192	0.6627	0.7063	0.7354	0.7645	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K

Windows (Uw = 1.60)			20.8200	1.5038	31.3083	(27)
Solid Door			1.7900	3.0000	5.3700	(26)
Opening			1.0800	1.5038	1.6241	(27a)
GF			5.4400	0.2500	1.3600	(28a)
1F			38.5800	0.2500	9.6450	(28b)
External Wall 1	66.3700	22.6100	43.7600	0.3000	13.1280	(29a)
Sheltered Wall	41.0800		41.0800	0.3000	12.3240	(29a)
Flat Roof	44.0000	1.0800	42.9200	0.1600	6.8672	(30)
Total net area of external elements Aum(A, m2)			195.4700			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		81.6265	(33)
Party Wall 1			170.3700	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)	39.0940 (36)
Point Thermal bridges (36a) =	0.0000
Total fabric heat loss (33) + (36) + (36a) =	120.7205 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	113.7157	111.7069	109.6981	99.6541	97.6453	87.6012	87.6012	85.5924	91.6188	97.6453	101.6629	105.6805	(38)
Heat transfer coeff	234.4362	232.4274	230.4186	220.3746	218.3658	208.3218	208.3218	206.3130	212.3394	218.3658	222.3834	226.4010	(39)
Average = Sum(39)m / 12 =												219.8724	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7057	1.6911	1.6765	1.6034	1.5888	1.5157	1.5157	1.5011	1.5450	1.5888	1.6180	1.6473	(40)
HLP (average)												1.5998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9120 (42)
Hot water usage for mixer showers	91.3066	89.9344	87.9349	84.1092	81.2860	78.1375	76.3479	78.3323	80.5075	83.8880	87.7959	90.9568 (42a)
Hot water usage for baths	31.5351	31.0667	30.4072	29.1912	28.2806	27.2710	26.7256	27.3805	28.0936	29.1740	30.4150	31.4285 (42b)
Hot water usage for other uses	44.4523	42.8358	41.2194	39.6029	37.9865	36.3700	36.3700	37.9865	39.6029	41.2194	42.8358	44.4523 (42c)
Average daily hot water use (litres/day)												153.8308 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	167.2940	163.8370	159.5615	152.9034	147.5531	141.7785	139.4435	143.6993	148.2040	154.2813	161.0467	166.8375	(44)
Energy conte	264.9527	233.3017	245.2401	209.3170	198.6348	174.3332	168.6449	177.9297	182.7504	209.3583	229.4406	261.2272	(45)
Energy content (annual)										Total = Sum(45)m =		2555.1307	
Distribution loss (46)m = 0.15 x (45)m	39.7429	34.9953	36.7860	31.3976	29.7952	26.1500	25.2967	26.6895	27.4126	31.4037	34.4161	39.1841	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	315.9116	279.3291	296.1990	258.6321	249.5937	223.6483	219.6038	228.8886	232.0654	260.3172	278.7557	312.1861	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	315.9116	279.3291	296.1990	258.6321	249.5937	223.6483	219.6038	228.8886	232.0654	260.3172	278.7557	312.1861	(64)
									Total per year (kWh/year) = Sum(64)m =			3155.1307	(64)
12Total per year (kWh/year)												3155	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	100.8365	89.0797	94.2821	81.9267	78.7858	70.2946	68.8141	71.9013	73.0933	82.3514	88.6178	99.5978	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	161.0875	178.3469	161.0875	166.4571	161.0875	166.4571	161.0875	161.0875	166.4571	161.0875	166.4571	161.0875	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.4821	309.6624	301.6481	284.5866	263.0494	242.8076	229.2848	226.1045	234.1188	251.1803	272.7174	292.9593	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	(71)
Water heating gains (Table 5)	135.5329	132.5590	126.7232	113.7871	105.8949	97.6313	92.4921	96.6416	101.5184	110.6873	123.0802	133.8680	(72)
Total internal gains	672.7832	690.2490	659.1395	634.5114	599.7125	573.5767	549.5451	550.5142	568.7750	592.6358	631.9354	657.5954	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	14.5200	10.6334	0.6300	0.7000	0.7700	47.1857 (74)
Southeast	6.3000	36.7938	0.6300	0.7000	0.7700	70.8414 (77)
South	1.0800	26.0000	0.6300	0.7000	1.0000	11.1450 (82)

Solar gains	129.1721	233.9907	359.4835	514.9943	642.9910	668.1473	631.7093	531.1935	412.2984	268.9969	157.2069	108.9635 (83)
Total gains	801.9553	924.2397	1018.6230	1149.5057	1242.7035	1241.7240	1181.2544	1081.7077	981.0734	861.6327	789.1423	766.5590 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.7123	41.0642	41.4222	43.3101	43.7085	45.8159	45.8159	46.2620	44.9490	43.7085	42.9189	42.1572	
alpha	3.7142	3.7376	3.7615	3.8873	3.9139	4.0544	4.0544	4.0841	3.9966	3.9139	3.8613	3.8105	
util living area	0.9978	0.9960	0.9920	0.9780	0.9377	0.8296	0.6899	0.7476	0.9231	0.9859	0.9962	0.9982	(86)
MIT	18.7938	18.9967	19.3413	19.8889	20.3749	20.7783	20.9257	20.8971	20.5929	19.9733	19.3434	18.8270	(87)
Th 2	19.5367	19.5472	19.5577	19.6108	19.6216	19.6757	19.6757	19.6867	19.6539	19.6216	19.6001	19.5789	(88)
util rest of house	0.9970	0.9944	0.9887	0.9678	0.9039	0.7331	0.5207	0.5886	0.8660	0.9775	0.9944	0.9976	(89)
MIT 2	17.5731	17.7827	18.1331	18.7117	19.1835	19.5681	19.6569	19.6563	19.4141	18.8071	18.1663	17.6356	(90)
Living area fraction										fLA = Living area / (4) =		0.1430	(91)
MIT	17.7477	17.9563	18.3060	18.8801	19.3539	19.7413	19.8384	19.8338	19.5827	18.9739	18.3347	17.8061	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7477	17.9563	18.3060	18.8801	19.3539	19.7413	19.8384	19.8338	19.5827	18.9739	18.3347	17.8061	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9954	0.9918	0.9843	0.9600	0.8951	0.7389	0.5443	0.6095	0.8619	0.9715	0.9920	0.9962	(94)
Useful gains	798.2467	916.6577	1002.6397	1103.5263	1112.4017	917.4749	642.9024	659.3221	845.5901	837.0581	782.8136	763.6814	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	3152.6242	3034.6499	2720.3129	2199.3622	1671.3556	1071.0353	674.6307	708.4350	1164.1914	1828.5701	2498.4075	3080.4262	(97)
Space heating kWh	1751.6569	1423.2908	1277.9489	789.0019	415.8617	0.0000	0.0000	0.0000	0.0000	737.6850	1235.2276	1723.6582	(98a)
Space heating requirement - total per year (kWh/year)												9354.3309	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	1751.6569	1423.2908	1277.9489	789.0019	415.8617	0.0000	0.0000	0.0000	0.0000	737.6850	1235.2276	1723.6582	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9354.3309	
Space heating per m2											(98c) / (4) =	68.0612	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	84.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1751.6569	1423.2908	1277.9489	789.0019	415.8617	0.0000	0.0000	0.0000	0.0000	737.6850	1235.2276	1723.6582	(98)
Space heating efficiency (main heating system 1)	84.4000	84.4000	84.4000	84.4000	84.4000	0.0000	0.0000	0.0000	0.0000	84.4000	84.4000	84.4000	(210)
Space heating fuel (main heating system)	2075.4229	1686.3635	1514.1574	934.8363	492.7271	0.0000	0.0000	0.0000	0.0000	874.0343	1463.5398	2042.2490	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	315.9116	279.3291	296.1990	258.6321	249.5937	223.6483	219.6038	228.8886	232.0654	260.3172	278.7557	312.1861	(64)
Efficiency of water heater												89.4000	(216)
(217)m	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	(217)

Fuel for water heating, kWh/month

	353.3687	312.4487	331.3188	289.2977	279.1876	250.1658	245.6418	256.0275	259.5810	291.1826	311.8073	349.2015 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	56.0056	50.5857	56.0056	54.1990	56.0056	54.1990	56.0056	56.0056	54.1990	56.0056	54.1990	56.0056 (231)
Lighting	34.2461	27.4735	24.7369	18.1233	13.9989	11.4373	12.7703	16.5993	21.5609	28.2891	31.9524	35.1979 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	11083.3304 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	89.4000
Water heating fuel used	3529.2290 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.7000, SFP = 1.1220)	
mechanical ventilation fans (SFP = 1.1220)	573.4213 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	659.4213 (231)
Electricity for lighting (calculated in Appendix L)	276.3860 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	15548.3667 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	11083.3304	0.2100	2327.4994	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3529.2290	0.2100	741.1381	(264)
Space and water heating			3068.6375	(265)
Pumps, fans and electric keep-hot	659.4213	0.1387	91.4699	(267)
Energy for lighting	276.3860	0.1443	39.8910	(268)
Total CO2, kg/year			3199.9984	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			23.2800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	11083.3304	1.1300	12524.1634	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3529.2290	1.1300	3988.0287	(278)
Space and water heating			16512.1921	(279)
Pumps, fans and electric keep-hot	659.4213	1.5128	997.5726	(281)
Energy for lighting	276.3860	1.5338	423.9300	(282)
Total Primary energy kWh/year			17933.6947	(286)
Dwelling Primary energy Rate (DPER)			130.4800	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	5.4400 (1b)	x	3.1600 (2b)	=	17.1904 (1b)	-
First floor	44.0000 (1c)	x	3.2500 (2c)	=	143.0000 (1c)	-
Second floor	44.0000 (1d)	x	3.0400 (2d)	=	133.7600 (1d)	-
Third floor	44.0000 (1e)	x	2.8400 (2e)	=	124.9600 (1e)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.4400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	418.9104	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0955	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3455	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2678	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3414	0.3347	0.3280	0.2945	0.2878	0.2544	0.2544	0.2477	0.2678	0.2878	0.3012	0.3146	(22b)
Effective ac	0.5583	0.5560	0.5538	0.5434	0.5414	0.5324	0.5324	0.5307	0.5358	0.5414	0.5454	0.5495	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type (Uw = 1.20)			20.8200	1.1450	23.8397			(27)
Opening			1.0800	1.5918	1.7191			(27a)
GF			5.4400	0.1300	0.7072			(28a)
1F			38.5800	0.1300	5.0154			(28b)
External Wall 1	66.3700	22.6100	43.7600	0.1800	7.8768			(29a)
Sheltered Wall	41.0800		41.0800	0.1800	7.3944			(29a)
Flat Roof	44.0000	1.0800	42.9200	0.1100	4.7212			(30)
Total net area of external elements Aum(A, m2)			195.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.0638			(33)
Party Wall 1			170.3700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	9.7735	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	62.8373	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	77.1757	76.8629	76.5562	75.1161	74.8467	73.5924	73.5924	73.3601	74.0755	74.8467	75.3918	75.9616	(38)
Heat transfer coeff	140.0130	139.7001	139.3935	137.9534	137.6840	136.4297	136.4297	136.1974	136.9128	137.6840	138.2290	138.7989	(39)
Average = Sum(39)m / 12 =												137.9521	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0187	1.0164	1.0142	1.0037	1.0018	0.9926	0.9926	0.9910	0.9962	1.0018	1.0057	1.0099	(40)
HLP (average)												1.0037	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9120	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
73.0453	71.9476	70.3479	67.2874	65.0288	62.5100	61.0783	62.6658	64.4060	67.1104	70.2367	72.7654	(42a)

Hot water usage for baths

	31.5351	31.0667	30.4072	29.1912	28.2806	27.2710	26.7256	27.3805	28.0936	29.1740	30.4150	31.4285 (42b)
Hot water usage for other uses												
	44.4523	42.8358	41.2194	39.6029	37.9865	36.3700	36.3700	37.9865	39.6029	41.2194	42.8358	44.4523 (42c)
Average daily hot water use (litres/day)												136.9944 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	149.0326	145.8501	141.9745	136.0815	131.2959	126.1510	124.1739	128.0328	132.1025	137.5037	143.4876	148.6462	(44)
Energy conte	236.0313	207.6886	218.2096	186.2888	176.7495	155.1174	150.1776	158.5313	162.8956	186.5913	204.4243	232.7440	(45)
Energy content (annual)										Total = Sum(45)m =		2275.4493	
Distribution loss (46)m = 0.15 x (45)m													
	35.4047	31.1533	32.7314	27.9433	26.5124	23.2676	22.5266	23.7797	24.4343	27.9887	30.6637	34.9116	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	286.9902	253.7160	269.1685	235.6038	227.7084	204.4324	201.1365	209.4903	212.2107	237.5502	253.7394	283.7029	(62)
WWHRS	-33.3933	-29.5333	-30.9255	-25.6076	-23.8653	-20.4217	-19.1421	-20.3557	-21.1291	-24.9089	-28.2188	-32.7749	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	253.5969	224.1828	238.2430	209.9963	203.8431	184.0107	181.9944	189.1345	191.0816	212.6413	225.5207	250.9280	(64)
										Total per year (kWh/year) = Sum(64)m =		2565.1731	(64)
12Total per year (kWh/year)												2565	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	91.2201	80.5633	85.2944	74.2698	71.5089	63.9053	62.6738	65.4514	66.4916	74.7813	80.2999	90.1271	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	145.6023	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	161.0875	178.3469	161.0875	166.4571	161.0875	166.4571	161.0875	161.0875	166.4571	161.0875	166.4571	161.0875	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	306.4821	309.6624	301.6481	284.5866	263.0494	242.8076	229.2848	226.1045	234.1188	251.1803	272.7174	292.9593	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	37.5602	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	-116.4819	(71)
Water heating gains (Table 5)													
	122.6077	119.8859	114.6430	103.1525	96.1142	88.7573	84.2390	87.9723	92.3494	100.5125	111.5276	121.1386	(72)
Total internal gains													
	659.8580	677.5759	647.0593	623.8768	589.9318	564.7027	541.2919	541.8450	559.6059	582.4610	620.3828	644.8660	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	14.5200	10.6334	0.6300	0.7000	0.7700	47.1857	(74)
Southeast	6.3000	36.7938	0.6300	0.7000	0.7700	70.8414	(77)
South	1.0800	26.0000	0.6300	0.7000	1.0000	11.1450	(82)

Solar gains	129.1721	233.9907	359.4835	514.9943	642.9910	668.1473	631.7093	531.1935	412.2984	268.9969	157.2069	108.9635	(83)
Total gains	789.0300	911.5665	1006.5428	1138.8711	1232.9227	1232.8500	1173.0012	1073.0385	971.9044	851.4579	777.5896	753.8295	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.1683	68.3209	68.4712	69.1860	69.3214	69.9587	69.9587	70.0780	69.7118	69.3214	69.0480	68.7646	
alpha	5.5446	5.5547	5.5647	5.6124	5.6214	5.6639	5.6639	5.6719	5.6475	5.6214	5.6032	5.5843	
util living area													
	0.9984	0.9960	0.9895	0.9596	0.8646	0.6757	0.5061	0.5721	0.8372	0.9775	0.9962	0.9988	(86)
MIT	19.7611	19.9278	20.1801	20.5382	20.8280	20.9678	20.9946	20.9898	20.8949	20.5193	20.0815	19.7363	(87)
Th 2	20.0678	20.0697	20.0715	20.0802	20.0819	20.0895	20.0895	20.0909	20.0865	20.0819	20.0786	20.0751	(88)
util rest of house													
	0.9979	0.9947	0.9858	0.9449	0.8195	0.5928	0.4044	0.4651	0.7689	0.9666	0.9947	0.9984	(89)
MIT 2	18.6114	18.8259	19.1484	19.6008	19.9341	20.0708	20.0877	20.0871	20.0120	19.5855	19.0296	18.5850	(90)
Living area fraction										fLA = Living area / (4) =		0.1430	(91)
MIT	18.7759	18.9836	19.2960	19.7349	20.0620	20.1991	20.2174	20.2162	20.1383	19.7191	19.1801	18.7497	(92)

Temperature adjustment												0.0000	
adjusted MIT	18.7759	18.9836	19.2960	19.7349	20.0620	20.1991	20.2174	20.2162	20.1383	19.7191	19.1801	18.7497	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9967	0.9925	0.9815	0.9380	0.8184	0.6033	0.4189	0.4803	0.7733	0.9607	0.9926	0.9974	(94)
Useful gains	786.4471	904.7059	987.9419	1068.2238	1009.0758	743.7420	491.3967	515.3362	751.5528	818.0266	771.8147	751.9015	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	2026.8089	1967.4765	1783.6773	1494.7118	1151.3138	763.8834	493.5247	519.7624	826.7215	1255.5553	1669.8203	2019.4814	(97)
Space heating kWh													
	922.8292	714.1819	592.0271	307.0713	105.8251	0.0000	0.0000	0.0000	0.0000	325.5213	646.5641	943.0795	(98a)
Space heating requirement - total per year (kWh/year)												4557.0995	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	922.8292	714.1819	592.0271	307.0713	105.8251	0.0000	0.0000	0.0000	0.0000	325.5213	646.5641	943.0795	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4557.0995	
Space heating per m2											(98c) / (4) =	33.1570	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	922.8292	714.1819	592.0271	307.0713	105.8251	0.0000	0.0000	0.0000	0.0000	325.5213	646.5641	943.0795	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	998.7329	772.9241	640.7220	332.3283	114.5294	0.0000	0.0000	0.0000	0.0000	352.2958	699.7446	1020.6488	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	253.5969	224.1828	238.2430	209.9963	203.8431	184.0107	181.9944	189.1345	191.0816	212.6413	225.5207	250.9280	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.8939	86.6821	86.2494	85.1944	83.0454	80.3000	80.3000	80.3000	80.3000	85.2907	86.5042	86.9431	(217)
Fuel for water heating, kWh/month													
	291.8466	258.6264	276.2256	246.4907	245.4598	229.1540	226.6431	235.5349	237.9596	249.3135	260.7048	288.6116	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	33.4708	26.8515	24.1768	17.7130	13.6820	11.1783	12.4812	16.2235	21.0727	27.6486	31.2290	34.4011	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-6.9324	-10.9407	-17.5763	-22.1577	-26.1084	-25.1966	-24.8858	-22.3579	-18.3692	-13.4764	-8.0221	-5.8651	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.0328	-2.2842	-4.7624	-7.5013	-10.2816	-10.4753	-10.3593	-8.6054	-6.0922	-3.3804	-1.4128	-0.8091	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4931.9258	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												3046.5706	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												270.1285	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-268.8856	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)

Appendix Q - special features		
Energy saved or generated		-0.0000 (236)
Energy used		0.0000 (237)
Total delivered energy for all uses		8065.7394 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4931.9258	0.2100	1035.7044	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3046.5706	0.2100	639.7798	(264)
Space and water heating			1675.4843	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	270.1285	0.1443	38.9879	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-201.8888	0.1323	-26.7157	
PV Unit electricity exported	-66.9968	0.1245	-8.3424	
Total			-35.0581	(269)
Total CO2, kg/year			1691.3433	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.3100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4931.9258	1.1300	5573.0762	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3046.5706	1.1300	3442.6248	(278)
Space and water heating			9015.7010	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	270.1285	1.5338	414.3321	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-201.8888	1.4889	-300.5991	
PV Unit electricity exported	-66.9968	0.4570	-30.6176	
Total			-331.2168	(283)
Total Primary energy kWh/year			9228.9172	(286)
Target Primary Energy Rate (TPER)			67.1500	(287)

Full SAP Calculation Printout

Property Reference	1.F Flat - 39-41 Oxford Street	Issued on Date	06/05/2023
Assessment Reference	00001	Prop Type Ref	Flat - 10-12 Museum Street
Property	Museum Street, London, WC1A		

SAP Rating	73 C	DER	34.42	TER	17.31
Environmental	76 C	% DER < TER			-98.84
CO_2 Emissions (t/year)	1.5	DFEE	98.24	TFEE	44.43
Compliance Check	See BREL	% DFEE < TFEE			-121.10
% DPER < TPER	-107.13	DPER	191.20	TPER	92.31

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)
Ground floor		53.0000 (1b)	x	2.8000 (2b)	=	148.4000 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	148.4000 (5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80	=	0.0000 (6a)
Number of open flues	0 * 20	=	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10	=	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20	=	0.0000 (6d)
Number of flues attached to other heater	0 * 35	=	0.0000 (6e)
Number of blocked chimneys	0 * 20	=	0.0000 (6f)
Number of intermittent extract fans	0 * 10	=	0.0000 (7a)
Number of passive vents	0 * 10	=	0.0000 (7b)
Number of flueless gas fires	0 * 40	=	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)	
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000 (17)	
Infiltration rate		0.7500 (18)	
Number of sides sheltered		3 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5813 (21)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.7411	0.7266	0.7120	0.6394	0.6248	0.5522	0.5522	0.5377	0.5813	0.6248	0.6539	0.6830	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	84.6000 (23c)

Effective ac	0.8181	0.8036	0.7890	0.7164	0.7018	0.6292	0.6292	0.6147	0.6583	0.7018	0.7309	0.7600	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.60)			13.3400	1.5038	20.0602			(27)
Solid Door			1.8900	3.0000	5.6700			(26)
GF			53.0000	0.2500	13.2500			(28b)

External Wall 1	56.1100	15.2300	40.8800	0.3000	12.2640	(29a)
Sheltered Wall	17.8600		17.8600	0.3000	5.3580	(29a)
Total net area of external elements Aum(A, m2)			126.9700			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.6022	(33)
Party Wall 1			25.7300	0.0000	0.0000	(32)
Party Ceiling 1			53.0000			(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		25.3940 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	81.9962 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.0637	39.3521	38.6404	35.0823	34.3707	30.8126	30.8126	30.1009	32.2358	34.3707	35.7939	37.2172	(38)
Heat transfer coeff	122.0598	121.3482	120.6366	117.0785	116.3668	112.8087	112.8087	112.0971	114.2320	116.3668	117.7901	119.2133	(39)
Average = Sum(39)m / 12 =												116.9006	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.3030	2.2896	2.2762	2.2090	2.1956	2.1285	2.1285	2.1150	2.1553	2.1956	2.2225	2.2493	(40)
HLP (average)												2.2057	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7786 (42)
Hot water usage for mixer showers	67.5502	66.5350	65.0557	62.2254	60.1367	57.8074	56.4835	57.9515	59.5608	62.0618	64.9529	67.2914 (42a)
Hot water usage for baths	23.3623	23.0153	22.5267	21.6258	20.9512	20.2033	19.7992	20.2844	20.8127	21.6131	22.5325	23.2833 (42b)
Hot water usage for other uses	32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442 (42c)
Average daily hot water use (litres/day)												113.7979 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.7567	121.2002	118.0380	113.1125	109.1549	104.8833	103.1553	106.3028	109.6347	114.1304	119.1353	123.4189	(44)
Energy conte	196.0003	172.5875	181.4200	154.8453	146.9435	128.9662	124.7573	131.6251	135.1906	154.8739	169.7300	193.2441	(45)
Energy content (annual)										Total = Sum(45)m =		1890.1839	
Distribution loss (46)m = 0.15 x (45)m	29.4000	25.8881	27.2130	23.2268	22.0415	19.3449	18.7136	19.7438	20.2786	23.2311	25.4595	28.9866	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	246.9592	218.6149	232.3789	204.1604	197.9024	178.2813	175.7162	182.5840	184.5057	205.8328	219.0451	244.2030	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	246.9592	218.6149	232.3789	204.1604	197.9024	178.2813	175.7162	182.5840	184.5057	205.8328	219.0451	244.2030	(64)
										Total per year (kWh/year) = Sum(64)m =		2490.1839	(64)
12Total per year (kWh/year)												2490	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	77.9098	68.8922	73.0619	63.8148	61.5984	55.2100	54.2215	56.5051	57.2796	64.2353	68.7640	76.9934	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.1887	86.5660	78.1887	80.7950	78.1887	80.7950	78.1887	78.1887	80.7950	78.1887	80.7950	78.1887	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	(71)
Water heating gains (Table 5)	104.7175	102.5181	98.2015	88.6317	82.7936	76.6806	72.8784	75.9477	79.5550	86.3378	95.5056	103.4858	(72)
Total internal gains	390.6024	398.3890	381.6413	366.0482	346.7104	329.9654	316.7171	318.1778	328.4451	344.2512	366.9187	382.5308	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.2400	10.6334	0.6300	0.7000	0.7700	30.0273	(74)
Southeast	4.1000	36.7938	0.6300	0.7000	0.7700	46.1032	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	76.1304	135.9144	204.9580	289.7589	360.1091	373.9115	353.6064	298.1063	233.5819	155.1009	92.2634	64.4869	(83)
Total gains	466.7328	534.3034	586.5993	655.8071	706.8194	703.8769	670.3235	616.2841	562.0270	499.3521	459.1821	447.0177	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.1537	30.3305	30.5094	31.4367	31.6289	32.6265	32.6265	32.8336	32.2200	31.6289	31.2467	30.8737	
alpha	3.0102	3.0220	3.0340	3.0958	3.1086	3.1751	3.1751	3.1889	3.1480	3.1086	3.0831	3.0582	
util living area	0.9909	0.9855	0.9755	0.9483	0.8883	0.7700	0.6369	0.6896	0.8688	0.9615	0.9856	0.9921	(86)
MIT	18.3658	18.6096	19.0247	19.6525	20.2281	20.6911	20.8808	20.8441	20.4873	19.7596	18.9954	18.3723	(87)
Th 2	19.1390	19.1473	19.1556	19.1976	19.2061	19.2491	19.2491	19.2577	19.2318	19.2061	19.1892	19.1723	(88)
util rest of house	0.9874	0.9799	0.9655	0.9245	0.8299	0.6396	0.4261	0.4867	0.7747	0.9389	0.9791	0.9891	(89)
MIT 2	16.8818	17.1285	17.5437	18.1815	18.7188	19.1216	19.2264	19.2226	18.9739	18.3012	17.5404	16.9095	(90)
Living area fraction										fLA = Living area / (4) =		0.5202	(91)
MIT	17.6537	17.8989	18.3141	18.9467	19.5039	19.9380	20.0870	20.0661	19.7612	19.0598	18.2973	17.6704	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6537	17.8989	18.3141	18.9467	19.5039	19.9380	20.0870	20.0661	19.7612	19.0598	18.2973	17.6704	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9833	0.9746	0.9591	0.9202	0.8418	0.6982	0.5368	0.5921	0.8092	0.9363	0.9745	0.9855	(94)
Useful gains	458.9603	520.7212	562.5789	603.4721	594.9845	491.4496	359.8257	364.9191	454.8134	467.5655	447.4542	440.5228	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1629.9522	1577.3990	1425.2116	1176.2484	908.1149	602.1748	393.3668	410.9582	646.6848	984.4410	1318.9307	1605.8573	(97)
Space heating kWh	871.2180	710.0875	641.7987	412.3990	232.9690	0.0000	0.0000	0.0000	0.0000	384.5553	627.4631	867.0088	(98a)
Space heating requirement - total per year (kWh/year)												4747.4995	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	871.2180	710.0875	641.7987	412.3990	232.9690	0.0000	0.0000	0.0000	0.0000	384.5553	627.4631	867.0088	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4747.4995	
Space heating per m2											(98c) / (4) =	89.5755	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	84.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	871.2180	710.0875	641.7987	412.3990	232.9690	0.0000	0.0000	0.0000	0.0000	384.5553	627.4631	867.0088	(98)
Space heating efficiency (main heating system 1)	84.4000	84.4000	84.4000	84.4000	84.4000	0.0000	0.0000	0.0000	0.0000	84.4000	84.4000	84.4000	(210)
Space heating fuel (main heating system)	1032.2488	841.3359	760.4250	488.6244	276.0296	0.0000	0.0000	0.0000	0.0000	455.6343	743.4397	1027.2617	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	246.9592	218.6149	232.3789	204.1604	197.9024	178.2813	175.7162	182.5840	184.5057	205.8328	219.0451	244.2030	(64)
Efficiency of water heater												89.4000	(216)
(217)m	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	(217)
Fuel for water heating, kWh/month	276.2407	244.5357	259.9317	228.3674	221.3673	199.4198	196.5506	204.2327	206.3822	230.2380	245.0169	273.1578	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	23.5111	21.2359	23.5111	22.7527	23.5111	22.7527	23.5111	23.5111	22.7527	23.5111	22.7527	23.5111	(231)
Lighting	17.0562	13.6831	12.3201	9.0262	6.9721	5.6963	6.3602	8.2672	10.7383	14.0893	15.9138	17.5302	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	5624.9994 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	89.4000
Water heating fuel used	2785.4407 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.7000, SFP = 1.0540)	
mechanical ventilation fans (SFP = 1.0540)	190.8246 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	276.8246 (231)
Electricity for lighting (calculated in Appendix L)	137.6532 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	8824.9178 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5624.9994	0.2100	1181.2499	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2785.4407	0.2100	584.9425	(264)
Space and water heating			1766.1924	(265)
Pumps, fans and electric keep-hot	276.8246	0.1387	38.3990	(267)
Energy for lighting	137.6532	0.1443	19.8676	(268)
Total CO2, kg/year			1824.4590	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			34.4200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	5624.9994	1.1300	6356.2493	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2785.4407	1.1300	3147.5479	(278)
Space and water heating			9503.7973	(279)
Pumps, fans and electric keep-hot	276.8246	1.5128	418.7802	(281)
Energy for lighting	137.6532	1.5338	211.1371	(282)
Total Primary energy kWh/year			10133.7146	(286)
Dwelling Primary energy Rate (DPER)			191.2000	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		53.0000 (1b)	x	2.8000 (2b)	=	148.4000 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000						(4)

Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 148.4000 (5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1348	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3848	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2982	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3802	0.3727	0.3653	0.3280	0.3206	0.2833	0.2833	0.2758	0.2982	0.3206	0.3355	0.3504	(22b)
Effective ac	0.5723	0.5695	0.5667	0.5538	0.5514	0.5401	0.5401	0.5380	0.5445	0.5514	0.5563	0.5614	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.3600	1.1450	13.0076			(27)
GF			53.0000	0.1300	6.8900			(28b)
External Wall 1	56.1100	13.2500	42.8600	0.1800	7.7148			(29a)
Sheltered Wall	17.8600		17.8600	0.1800	3.2148			(29a)
Total net area of external elements Aum(A, m2)			126.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.7172			(33)
Party Wall 1			25.7300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	6.3485	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	39.0657	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.0255	27.8881	27.7534	27.1206	27.0022	26.4510	26.4510	26.3490	26.6633	27.0022	27.2417	27.4921	(38)
Heat transfer coeff	67.0913	66.9538	66.8191	66.1863	66.0679	65.5168	65.5168	65.4147	65.7291	66.0679	66.3074	66.5578	(39)
Average = Sum(39)m / 12 =												66.1857	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2659	1.2633	1.2607	1.2488	1.2466	1.2362	1.2362	1.2342	1.2402	1.2466	1.2511	1.2558	(40)
HLP (average)												1.2488	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7786	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
54.0401	53.2280	52.0446	49.7804	48.1094	46.2459	45.1868	46.3612	47.6487	49.6494	51.9623	53.8331	(42a)

Hot water usage for baths

23.3623	23.0153	22.5267	21.6258	20.9512	20.2033	19.7992	20.2844	20.8127	21.6131	22.5325	23.2833	(42b)

Hot water usage for other uses

32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442	(42c)

Average daily hot water use (litres/day)	101.3421 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.2466	107.8932	105.0269	100.6674	97.1275	93.3218	91.8586	94.7125	97.7226	101.7180	106.1447	109.9606	(44)
Energy conte	174.6037	153.6385	161.4224	137.8086	130.7523	114.7500	111.0950	117.2739	120.5017	138.0304	151.2226	172.1717	(45)
Energy content (annual)										Total = Sum(45)m =		1683.2709	

Distribution loss (46)m = 0.15 x (45)m

26.1906	23.0458	24.2134	20.6713	19.6128	17.2125	16.6642	17.5911	18.0753	20.7046	22.6834	25.8258	(46)

Water storage loss:
Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.4951	46.0217	46.8101	48.2645	48.1919	50.9589	49.3151	50.9589 (61)

Total heat required for water heating calculated for each month

	225.5626	199.6659	212.3813	187.1237	180.2475	160.7717	157.9051	165.5384	168.6936	188.9893	200.5377	223.1306 (62)
WWHRS	-24.7049	-21.8492	-22.8792	-18.9449	-17.6560	-15.1083	-14.1617	-15.0595	-15.6317	-18.4280	-20.8767	-24.2474 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	200.8577	177.8167	189.5021	168.1788	162.5915	145.6633	143.7434	150.4789	153.0620	170.5613	179.6609	198.8832 (64)

Total per year (kWh/year) = Sum(64)m = 2040.9999 (64)

12Total per year (kWh/year) 2041 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	70.7955	62.5917	66.4127	58.1501	55.8489	49.6598	48.6416	51.0597	52.1148	58.6348	62.6103	69.9868 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	78.3035	86.6931	78.3035	80.9136	78.3035	80.9136	78.3035	78.3035	80.9136	78.3035	80.9136	78.3035 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424 (71)

Water heating gains (Table 5)

	95.1552	93.1423	89.2643	80.7641	75.0658	68.9719	65.3785	68.6286	72.3817	78.8103	86.9587	94.0683 (72)

Total internal gains

	381.1549	389.1403	372.8190	358.2992	339.0973	322.3754	309.3320	310.9735	321.3903	336.8385	358.4905	373.2282 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.8700	10.6334	0.6300	0.7000	0.7700	25.5752	(74)
Southeast	3.4900	36.7938	0.6300	0.7000	0.7700	39.2439	(77)

Solar gains	64.8191	115.7223	174.5142	246.7286	306.6399	318.3965	301.1047	253.8396	198.8895	132.0599	78.5554	54.9053 (83)
Total gains	445.9740	504.8626	547.3332	605.0278	645.7372	640.7718	610.4367	564.8131	520.2798	468.8984	437.0459	428.1335 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.8589	54.9716	55.0824	55.6090	55.7087	56.1773	56.1773	56.2649	55.9959	55.7087	55.5074	55.2986	
alpha	4.6573	4.6648	4.6722	4.7073	4.7139	4.7452	4.7452	4.7510	4.7331	4.7139	4.7005	4.6866	
util living area	0.9917	0.9843	0.9686	0.9182	0.8039	0.6212	0.4651	0.5199	0.7645	0.9409	0.9840	0.9931	(86)
MIT	19.6567	19.8486	20.1302	20.5125	20.8105	20.9577	20.9913	20.9856	20.8891	20.5112	20.0236	19.6249	(87)
Th 2	19.8677	19.8697	19.8717	19.8812	19.8829	19.8912	19.8912	19.8927	19.8880	19.8829	19.8794	19.8756	(88)
util rest of house	0.9890	0.9793	0.9582	0.8911	0.7447	0.5271	0.3516	0.4012	0.6777	0.9153	0.9779	0.9909	(89)
MIT 2	18.3341	18.5783	18.9328	19.4027	19.7306	19.8685	19.8886	19.8880	19.8168	19.4134	18.8091	18.2992	(90)
Living area fraction									fLA = Living area / (4) =			0.5202	(91)
MIT	19.0221	19.2391	19.5557	19.9800	20.2923	20.4351	20.4622	20.4589	20.3746	19.9844	19.4409	18.9888	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0221	19.2391	19.5557	19.9800	20.2923	20.4351	20.4622	20.4589	20.3746	19.9844	19.4409	18.9888	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9863	0.9757	0.9546	0.8938	0.7680	0.5747	0.4108	0.4631	0.7183	0.9181	0.9749	0.9885	(94)
Useful gains	439.8778	492.6005	522.4658	540.7861	495.9278	368.2778	250.7552	261.5636	373.7395	430.4882	426.0600	423.2012	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)

Heat loss rate W

	987.7243	960.0580	872.3678	733.3460	567.6787	382.2962	253.0391	265.5128	412.4229	620.0109	818.2930	984.3099 (97)
Space heating kWh												
	407.5978	314.1314	260.3271	138.6432	53.3827	0.0000	0.0000	0.0000	0.0000	141.0049	282.4077	417.4649 (98a)
Space heating requirement - total per year (kWh/year)												2014.9597
Solar heating kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh												
	407.5978	314.1314	260.3271	138.6432	53.3827	0.0000	0.0000	0.0000	0.0000	141.0049	282.4077	417.4649 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2014.9597
Space heating per m2											(98c) / (4) =	38.0181 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	407.5978	314.1314	260.3271	138.6432	53.3827	0.0000	0.0000	0.0000	0.0000	141.0049	282.4077	417.4649	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	441.1232	339.9691	281.7393	150.0467	57.7734	0.0000	0.0000	0.0000	0.0000	152.6027	305.6361	451.8018	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	200.8577	177.8167	189.5021	168.1788	162.5915	145.6633	143.7434	150.4789	153.0620	170.5613	179.6609	198.8832	(64)
Efficiency of water heater													
(217)m	85.8643	85.5868	85.0622	83.9706	82.2671	80.3000	80.3000	80.3000	80.3000	83.9765	85.3460	85.9304	(217)
Fuel for water heating, kWh/month													
	233.9245	207.7617	222.7807	200.2830	197.6386	181.3989	179.0080	187.3958	190.6127	203.1059	210.5088	231.4470	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.2699	13.0523	11.7522	8.6101	6.6507	5.4337	6.0670	7.8861	10.2433	13.4398	15.1802	16.7221	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.3305	-21.3027	-32.2745	-38.3255	-43.1419	-40.9563	-40.4762	-37.3157	-32.0494	-25.2601	-16.1467	-12.2660	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.0701	-10.9086	-22.1352	-33.9139	-45.4920	-45.9284	-45.3691	-38.1004	-27.5303	-15.7974	-6.8336	-3.9901	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2180.6923 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	2445.8657 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	131.3075 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-654.9144 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4188.9511 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2180.6923	0.2100	457.9454	(261)

Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2445.8657	0.2100	513.6318 (264)
Space and water heating			971.5772 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	131.3075	0.1443	18.9517 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-353.8454	0.1335	-47.2275
PV Unit electricity exported	-301.0690	0.1253	-37.7323
Total			-84.9598 (269)
Total CO2, kg/year			917.4984 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.3100 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2180.6923	1.1300	2464.1823	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2445.8657	1.1300	2763.8282	(278)
Space and water heating			5228.0105	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	131.3075	1.5338	201.4039	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-353.8454	1.4932	-528.3676	
PV Unit electricity exported	-301.0690	0.4600	-138.4957	
Total			-666.8633	(283)
Total Primary energy kWh/year			4892.6520	(286)
Target Primary Energy Rate (TPER)			92.3100	(287)

Full SAP Calculation Printout

Property Reference	2.F Flat - 10-12 Museum Street	Issued on Date	06/05/2023
Assessment Reference	00001	Prop Type Ref	Flat - 10-12 Museum Street
Property	Museum Street, London, WC1A		

SAP Rating	78 C	DER	25.62	TER	13.83
Environmental	82 B	% DER < TER			-85.25
CO_2 Emissions (t/year)	1.08	DFEE	63.73	TFEE	28.62
Compliance Check	See BREL	% DFEE < TFEE			-122.70
% DPER < TPER	-95.26	DPER	143.75	TPER	73.62

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000 (1b)	x	2.7400 (2b)	=	142.4800 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	142.4800	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.7500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5813	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.7411	0.7266	0.7120	0.6394	0.6248	0.5522	0.5522	0.5377	0.5813	0.6248	0.6539	0.6830	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	84.6000 (23c)

Effective ac	0.8181	0.8036	0.7890	0.7164	0.7018	0.6292	0.6292	0.6147	0.6583	0.7018	0.7309	0.7600	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.60)			13.3000	1.5038	20.0000			(27)
Solid Door			1.8900	3.0000	5.6700			(26)
External Wall 1	51.6200	15.1900	36.4300	0.3000	10.9290			(29a)

Total net area of external elements Aum(A, m2)	51.6200		(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	36.5990	(33)
Party Wall 1	33.9500	0.0000	0.0000 (32)
Party Floor 1	52.0000		(32d)
Party Ceiling 1	52.0000		(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	10.3240	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 46.9230	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.4655	37.7822	37.0990	33.6828	32.9996	29.5834	29.5834	28.9002	30.9499	32.9996	34.3660	35.7325	(38)
Heat transfer coeff	85.3885	84.7052	84.0220	80.6058	79.9226	76.5064	76.5064	75.8232	77.8729	79.9226	81.2890	82.6555	(39)

Average = Sum(39)m / 12 = 80.4350

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6421	1.6289	1.6158	1.5501	1.5370	1.4713	1.4713	1.4581	1.4976	1.5370	1.5633	1.5895	(40)
HLP (average)												1.5468	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7491 (42)

Hot water usage for mixer showers

66.9321	65.9262	64.4605	61.6561	59.5865	57.2785	55.9666	57.4213	59.0158	61.4939	64.3586	66.6756	(42a)

Hot water usage for baths

23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)

Hot water usage for other uses

32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)

Average daily hot water use (litres/day) 112.7563 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.6239	120.0909	116.9577	112.0772	108.1559	103.9233	102.2111	105.3299	108.6313	113.0858	118.0449	122.2892	(44)
Energy conte	194.2064	171.0079	179.7596	153.4281	145.5986	127.7859	123.6155	130.4204	133.9532	153.4563	168.1765	191.4754	(45)

Energy content (annual) Total = Sum(45)m = 1872.8838

Distribution loss (46)m = 0.15 x (45)m

29.1310	25.6512	26.9639	23.0142	21.8398	19.1679	18.5423	19.5631	20.0930	23.0185	25.2265	28.7213	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

245.1653	217.0353	230.7185	202.7432	196.5575	177.1009	174.5744	181.3793	183.2683	204.4152	217.4916	242.4343	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

245.1653	217.0353	230.7185	202.7432	196.5575	177.1009	174.5744	181.3793	183.2683	204.4152	217.4916	242.4343	(64)

Total per year (kWh/year) = Sum(64)m = 2472.8838 (64)

12Total per year (kWh/year) 2473 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

77.3133	68.3670	72.5098	63.3436	61.1513	54.8176	53.8419	56.1045	56.8682	63.7640	68.2475	76.4053	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8814	85.1187	76.8814	79.4441	76.8814	79.4441	76.8814	76.8814	79.4441	76.8814	79.4441	76.8814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)	103.9158	101.7366	97.4594	87.9773	82.1925	76.1355	72.3681	75.4093	78.9836	85.7042	94.7881	102.6953	(72)
Total internal gains	385.4592	393.0989	376.5986	361.1938	342.1351	325.5737	312.5182	313.9776	324.1005	339.7438	362.1017	377.5132	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	9.6000	11.2829	0.6300	0.7000	0.7700	33.1028 (75)
Southwest	3.7000	36.7938	0.6300	0.7000	0.7700	41.6053 (79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	74.7081	138.2510	218.3669	319.5206	402.5722	419.3153	396.0854	331.1205	252.9226	160.6715	91.4855	62.6389	(83)
Total gains	460.1673	531.3499	594.9656	680.7144	744.7073	744.8890	708.6036	645.0981	577.0231	500.4153	453.5872	440.1521	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.2904	42.6315	42.9782	44.7996	45.1826	47.2001	47.2001	47.6254	46.3719	45.1826	44.4231	43.6887	
alpha	3.8194	3.8421	3.8652	3.9866	4.0122	4.1467	4.1467	4.1750	4.0915	4.0122	3.9615	3.9126	
util living area	0.9910	0.9835	0.9669	0.9136	0.7997	0.6126	0.4634	0.5208	0.7740	0.9436	0.9837	0.9923	(86)
MIT	19.1649	19.4051	19.7781	20.3209	20.7155	20.9352	20.9839	20.9750	20.8241	20.3087	19.6892	19.1833	(87)
Th 2	19.5826	19.5922	19.6018	19.6501	19.6599	19.7091	19.7091	19.7190	19.6893	19.6599	19.6404	19.6210	(88)
util rest of house	0.9878	0.9779	0.9552	0.8829	0.7330	0.5069	0.3333	0.3854	0.6776	0.9168	0.9771	0.9897	(89)
MIT 2	17.9738	18.2177	18.5898	19.1400	19.4860	19.6832	19.7058	19.7131	19.6035	19.1490	18.5358	18.0196	(90)
Living area fraction										fLA = Living area / (4) =		0.4683	(91)
MIT	18.5315	18.7737	19.1462	19.6930	20.0618	20.2695	20.3043	20.3040	20.1751	19.6920	19.0759	18.5645	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5315	18.7737	19.1462	19.6930	20.0618	20.2695	20.3043	20.3040	20.1751	19.6920	19.0759	18.5645	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9846	0.9735	0.9503	0.8841	0.7550	0.5548	0.3945	0.4491	0.7169	0.9176	0.9735	0.9869	(94)
Useful gains	453.0955	517.2573	565.3747	601.8066	562.2428	413.2396	279.5642	289.7051	413.6529	459.1743	441.5581	434.4029	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1215.2076	1175.1748	1062.5608	869.9768	668.2943	433.7499	283.4023	296.0135	473.0823	726.6568	973.5080	1187.3074	(97)
Space heating kWh	567.0114	442.1206	369.9064	193.0825	78.9023	0.0000	0.0000	0.0000	0.0000	199.0070	383.0039	560.1610	(98a)
Space heating requirement - total per year (kWh/year)												2793.1951	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	567.0114	442.1206	369.9064	193.0825	78.9023	0.0000	0.0000	0.0000	0.0000	199.0070	383.0039	560.1610	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2793.1951	
Space heating per m2											(98c) / (4) =	53.7153	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	84.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	567.0114	442.1206	369.9064	193.0825	78.9023	0.0000	0.0000	0.0000	0.0000	199.0070	383.0039	560.1610	(98)
Space heating efficiency (main heating system 1)	84.4000	84.4000	84.4000	84.4000	84.4000	0.0000	0.0000	0.0000	0.0000	84.4000	84.4000	84.4000	(210)
Space heating fuel (main heating system)	671.8144	523.8396	438.2778	228.7708	93.4861	0.0000	0.0000	0.0000	0.0000	235.7903	453.7961	663.6978	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	245.1653	217.0353	230.7185	202.7432	196.5575	177.1009	174.5744	181.3793	183.2683	204.4152	217.4916	242.4343	(64)
Efficiency of water heater												89.4000	(216)
(217)m	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	(217)
Fuel for water heating, kWh/month	274.2341	242.7688	258.0744	226.7821	219.8630	198.0995	195.2734	202.8851	204.9981	228.6524	243.2792	271.1793	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	22.8646	20.6519	22.8646	22.1270	22.8646	22.1270	22.8646	22.8646	22.1270	22.8646	22.1270	22.8646	(231)
Lighting	16.3445	13.1121	11.8060	8.6496	6.6812	5.4586	6.0948	7.9223	10.2903	13.5014	15.2498	16.7987	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													

(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3309.4729	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.4000	
Water heating fuel used	2766.0893	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.7000, SFP = 1.0540)		
mechanical ventilation fans (SFP = 1.0540)	183.2122	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	269.2122	(231)
Electricity for lighting (calculated in Appendix L)	131.9093	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	6476.6836	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3309.4729	0.2100	694.9893	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2766.0893	0.2100	580.8787	(264)
Space and water heating			1275.8680	(265)
Pumps, fans and electric keep-hot	269.2122	0.1387	37.3430	(267)
Energy for lighting	131.9093	0.1443	19.0386	(268)
Total CO2, kg/year			1332.2497	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			25.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3309.4729	1.1300	3739.7043	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2766.0893	1.1300	3125.6809	(278)
Space and water heating			6865.3852	(279)
Pumps, fans and electric keep-hot	269.2122	1.5128	407.2642	(281)
Energy for lighting	131.9093	1.5338	202.3269	(282)
Total Primary energy kWh/year			7474.9762	(286)
Dwelling Primary energy Rate (DPER)			143.7500	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		52.0000 (1b)	x	2.7400 (2b)	=	142.4800 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	142.4800	(5)

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2. Ventilation rate
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			m3 per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
			Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1404 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3904 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3025 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3857	0.3782	0.3706	0.3328	0.3252	0.2874	0.2874	0.2798	0.3025	0.3252	0.3404	0.3555	(22b)
Effective ac	0.5744	0.5715	0.5687	0.5554	0.5529	0.5413	0.5413	0.5392	0.5458	0.5529	0.5579	0.5632	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.1100	1.1450	12.7214			(27)
External Wall 1	51.6200	13.0000	38.6200	0.1800	6.9516			(29a)
Total net area of external elements Aum(A, m2)			51.6200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.5630			(33)
Party Wall 1			33.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		2.5810 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.1440 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.0072	26.8713	26.7382	26.1128	25.9958	25.4512	25.4512	25.3503	25.6610	25.9958	26.2325	26.4800	(38)
Heat transfer coeff	51.1511	51.0153	50.8822	50.2568	50.1398	49.5951	49.5951	49.4943	49.8049	50.1398	50.3765	50.6240	(39)
Average = Sum(39)m / 12 =												50.2563	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9837	0.9811	0.9785	0.9665	0.9642	0.9538	0.9538	0.9518	0.9578	0.9642	0.9688	0.9735	(40)
HLP (average)												0.9665	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.7491 (42)
Hot water usage for mixer showers		
53.5457 52.7410 51.5684 49.3249 47.6692 45.8228 44.7733 45.9370 47.2127 49.1951 51.4869 53.3405		(42a)
Hot water usage for baths		
23.1496 22.8058 22.3217 21.4290 20.7606 20.0194 19.6190 20.0998 20.6232 21.4163 22.3274 23.0714		(42b)
Hot water usage for other uses		
32.5422 31.3589 30.1755 28.9922 27.8088 26.6255 26.6255 27.8088 28.9922 30.1755 31.3589 32.5422		(42c)
Average daily hot water use (litres/day)		100.4145 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.2375	106.9057	104.0656	99.7460	96.2386	92.4676	91.0178	93.8456	96.8281	100.7870	105.1731	108.9541	(44)
Energy conte	173.0055	152.2323	159.9449	136.5473	129.5556	113.6997	110.0781	116.2005	119.3987	136.7670	149.8384	170.5958	(45)
Energy content (annual)										Total = Sum(45)m =		1667.8640	
Distribution loss (46)m = 0.15 x (45)m	25.9508	22.8348	23.9917	20.4821	19.4333	17.0550	16.5117	17.4301	17.9098	20.5151	22.4758	25.5894	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.1898	49.0421	45.6005	46.3817	47.8227	47.7508	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	223.9644	198.2597	210.9038	185.7371	178.5977	159.3002	156.4598	164.0232	167.1496	187.7259	199.1535	221.5547 (62)
WWHRS	-24.4788	-21.6493	-22.6699	-18.7716	-17.4944	-14.9701	-14.0321	-14.9217	-15.4886	-18.2594	-20.6857	-24.0255 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
	199.4856	176.6104	188.2340	166.9656	161.1033	144.3301	142.4277	149.1015	151.6609	169.4665	178.4678	197.5292 (64)
										Total per year (kWh/year) = Sum(64)m =		2025.3825 (64)
12Total per year (kWh/year)												2025 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month												
	70.2641	62.1241	65.9214	57.6994	55.3378	49.2053	48.1964	50.5923	51.6378	58.2148	62.1500	69.4628 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.0079	85.2588	77.0079	79.5748	77.0079	79.5748	77.0079	77.0079	79.5748	77.0079	79.5748	77.0079	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)													
	94.4410	92.4465	88.6041	80.1381	74.3787	68.3407	64.7801	68.0005	71.7191	78.2456	86.3195	93.3640	(72)
Total internal gains													
	376.1109	383.9490	367.8698	353.4854	334.4478	317.9096	305.0567	306.6953	316.9668	332.4117	353.7638	368.3085	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.0200	11.2829	0.6300	0.7000	0.7700	27.6547	(75)
Southwest	3.0900	36.7938	0.6300	0.7000	0.7700	34.7460	(79)

Solar gains	62.4007	115.4773	182.4001	266.8990	336.2776	350.2654	330.8601	276.5903	211.2662	134.2056	76.4145	52.3196	(83)
Total gains	438.5116	499.4263	550.2699	620.3845	670.7254	668.1750	635.9168	583.2857	528.2329	466.6173	430.1783	420.6281	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.5969	70.7848	70.9701	71.8532	72.0208	72.8118	72.8118	72.9602	72.5051	72.0208	71.6824	71.3321	
alpha	5.7065	5.7190	5.7313	5.7902	5.8014	5.8541	5.8541	5.8640	5.8337	5.8014	5.7788	5.7555	
util living area													
	0.9890	0.9764	0.9450	0.8441	0.6671	0.4718	0.3427	0.3894	0.6310	0.8959	0.9760	0.9911	(86)
MIT	20.1060	20.2902	20.5366	20.8199	20.9598	20.9954	20.9994	20.9988	20.9779	20.7794	20.4023	20.0765	(87)
Th 2	20.0970	20.0991	20.1013	20.1114	20.1133	20.1221	20.1221	20.1237	20.1187	20.1133	20.1094	20.1054	(88)
util rest of house													
	0.9858	0.9697	0.9300	0.8087	0.6124	0.4086	0.2746	0.3157	0.5583	0.8622	0.9680	0.9885	(89)
MIT 2	19.0719	19.3046	19.6089	19.9425	20.0829	20.1197	20.1219	20.1233	20.1053	19.9088	19.4557	19.0411	(90)
Living area fraction										fLA = Living area / (4) =		0.4683	(91)
MIT	19.5562	19.7661	20.0433	20.3533	20.4935	20.5297	20.5328	20.5333	20.5140	20.3164	19.8990	19.5260	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5562	19.7661	20.0433	20.3533	20.4935	20.5297	20.5328	20.5333	20.5140	20.3164	19.8990	19.5260	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9833	0.9667	0.9289	0.8190	0.6364	0.4381	0.3065	0.3502	0.5916	0.8707	0.9657	0.9863	(94)
Useful gains	431.1954	482.7806	511.1290	508.0799	426.8458	292.7324	194.9138	204.2875	312.5084	406.2902	415.4184	414.8560	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	780.3706	758.4010	689.1130	575.6076	440.9051	294.0864	195.0477	204.5728	319.4465	487.1809	644.7681	775.8608	(97)
Space heating kWh													

	259.7863	185.2169	132.4201	48.6200	10.4601	0.0000	0.0000	0.0000	0.0000	60.1827	165.1318	268.5876 (98a)
Space heating requirement - total per year (kWh/year)												1130.4057
Solar heating kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh												
	259.7863	185.2169	132.4201	48.6200	10.4601	0.0000	0.0000	0.0000	0.0000	60.1827	165.1318	268.5876 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1130.4057
Space heating per m2											(98c) / (4) =	21.7386 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	259.7863	185.2169	132.4201	48.6200	10.4601	0.0000	0.0000	0.0000	0.0000	60.1827	165.1318	268.5876	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	281.1540	200.4512	143.3118	52.6190	11.3205	0.0000	0.0000	0.0000	0.0000	65.1328	178.7141	290.6792	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	199.4856	176.6104	188.2340	166.9656	161.1033	144.3301	142.4277	149.1015	151.6609	169.4665	178.4678	197.5292	(64)
Efficiency of water heater													
(217)m	84.9483	84.4836	83.6415	82.0910	80.7764	80.3000	80.3000	80.3000	80.3000	82.3887	84.2153	85.0404	(217)
Fuel for water heating, kWh/month													
	234.8317	209.0470	225.0486	203.3909	199.4435	179.7386	177.3695	185.6805	188.8679	205.6915	211.9185	232.2769	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.0007	12.8364	11.5577	8.4677	6.5407	5.3438	5.9666	7.7557	10.0738	13.2174	14.9290	16.4454	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.0683	-20.9172	-31.6975	-37.6496	-42.3904	-40.2476	-39.7772	-36.6675	-31.4861	-24.8082	-15.8531	-12.0411	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-4.9663	-10.6863	-21.6856	-33.2268	-44.5711	-44.9977	-44.4484	-37.3257	-26.9695	-15.4746	-6.6935	-3.9083	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1223.3827 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	2453.3051 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	129.1350 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-642.5576 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3249.2653 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1223.3827	0.2100	256.9104	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2453.3051	0.2100	515.1941	(264)
Space and water heating			772.1045	(265)

Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	129.1350	0.1443	18.6382 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-347.6038	0.1335	-46.3925
PV Unit electricity exported	-294.9537	0.1253	-36.9657
Total			-83.3582 (269)
Total CO2, kg/year			719.3137 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8300 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1223.3827	1.1300	1382.4225 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2453.3051	1.1300	2772.2348 (278)
Space and water heating			4154.6573 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	129.1350	1.5338	198.0716 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-347.6038	1.4932	-519.0405
PV Unit electricity exported	-294.9537	0.4600	-135.6819
Total			-654.7223 (283)
Total Primary energy kWh/year			3828.1074 (286)
Target Primary Energy Rate (TPER)			73.6200 (287)

Full SAP Calculation Printout

Property Reference	2.F Flat - 39-41 Oxford Street	Issued on Date	06/05/2023
Assessment Reference	00001	Prop Type Ref	Flat - 10-12 Museum Street
Property	Museum Street, London, WC1A		

SAP Rating	77 C	DER	26.60	TER	14.21
Environmental	81 B	% DER < TER			-87.19
CO_2 Emissions (t/year)	1.15	DFEE	67.80	TFEE	30.35
Compliance Check	See BREL	% DFEE < TFEE			-123.39
% DPER < TPER	-96.57	DPER	148.73	TPER	75.66

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	53.0000	(1b)	x 2.4800	(2b) =	131.4400	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		131.4400	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.7500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5813 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.7411	0.7266	0.7120	0.6394	0.6248	0.5522	0.5522	0.5377	0.5813	0.6248	0.6539	0.6830	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	84.6000 (23c)

Effective ac	0.8181	0.8036	0.7890	0.7164	0.7018	0.6292	0.6292	0.6147	0.6583	0.7018	0.7309	0.7600	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.60)			10.8900	1.5038	16.3759			(27)
Solid Door			1.8900	3.0000	5.6700			(26)
External Wall 1	49.7000	12.7800	36.9200	0.3000	11.0760			(29a)

Sheltered Wall	15.8200	15.8200	0.3000	4.7460	(29a)
Total net area of external elements Aum(A, m2)		65.5200			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		37.8679	(33)
Party Wall 1		22.7900	0.0000	0.0000	(32)
Party Floor 1		53.0000			(32d)
Party Ceiling 1		53.0000			(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		13.1040 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	50.9719 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.4850	34.8547	34.2244	31.0729	30.4426	27.2911	27.2911	26.6608	28.5517	30.4426	31.7032	32.9638	(38)
Heat transfer coeff	86.4569	85.8266	85.1963	82.0448	81.4146	78.2631	78.2631	77.6328	79.5237	81.4146	82.6751	83.9357	(39)
Average = Sum(39)m / 12 =												81.8873	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6313	1.6194	1.6075	1.5480	1.5361	1.4767	1.4767	1.4648	1.5004	1.5361	1.5599	1.5837	(40)
HLP (average)												1.5450	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7786 (42)
Hot water usage for mixer showers	67.5502	66.5350	65.0557	62.2254	60.1367	57.8074	56.4835	57.9515	59.5608	62.0618	64.9529	67.2914 (42a)
Hot water usage for baths	23.3623	23.0153	22.5267	21.6258	20.9512	20.2033	19.7992	20.2844	20.8127	21.6131	22.5325	23.2833 (42b)
Hot water usage for other uses	32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442 (42c)
Average daily hot water use (litres/day)												113.7979 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.7567	121.2002	118.0380	113.1125	109.1549	104.8833	103.1553	106.3028	109.6347	114.1304	119.1353	123.4189	(44)
Energy conte	196.0003	172.5875	181.4200	154.8453	146.9435	128.9662	124.7573	131.6251	135.1906	154.8739	169.7300	193.2441	(45)
Energy content (annual)										Total = Sum(45)m =		1890.1839	
Distribution loss (46)m = 0.15 x (45)m	29.4000	25.8881	27.2130	23.2268	22.0415	19.3449	18.7136	19.7438	20.2786	23.2311	25.4595	28.9866	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	246.9592	218.6149	232.3789	204.1604	197.9024	178.2813	175.7162	182.5840	184.5057	205.8328	219.0451	244.2030	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	246.9592	218.6149	232.3789	204.1604	197.9024	178.2813	175.7162	182.5840	184.5057	205.8328	219.0451	244.2030	(64)
										Total per year (kWh/year) = Sum(64)m =		2490.1839	(64)
12Total per year (kWh/year)												2490	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	77.9098	68.8922	73.0619	63.8148	61.5984	55.2100	54.2215	56.5051	57.2796	64.2353	68.7640	76.9934	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.5370	86.9517	78.5370	81.1549	78.5370	81.1549	78.5370	78.5370	81.1549	78.5370	81.1549	78.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	(71)
Water heating gains (Table 5)	104.7175	102.5181	98.2015	88.6317	82.7936	76.6806	72.8784	75.9477	79.5550	86.3378	95.5056	103.4858	(72)
Total internal gains	390.9507	398.7746	381.9896	366.4081	347.0587	330.3253	317.0654	318.5261	328.8050	344.5995	367.2786	382.8792	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.2400	10.6334	0.6300	0.7000	0.7700	30.0273	(74)
Southeast	1.6500	36.7938	0.6300	0.7000	0.7700	18.5537	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	48.5810	88.9875	140.7505	210.2027	270.9996	285.4464	268.3166	219.9437	164.0588	103.2367	59.2656	40.9103	(83)
Total gains	439.5317	487.7621	522.7402	576.6109	618.0582	615.7717	585.3820	538.4698	492.8638	447.8361	426.5442	423.7895	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.5710	42.8836	43.2009	44.8603	45.2076	47.0280	47.0280	47.4098	46.2825	45.2076	44.5183	43.8497	
alpha	3.8381	3.8589	3.8801	3.9907	4.0138	4.1352	4.1352	4.1607	4.0855	4.0138	3.9679	3.9233	
util living area	0.9927	0.9883	0.9792	0.9486	0.8726	0.7146	0.5594	0.6172	0.8439	0.9619	0.9876	0.9937	(86)
MIT	19.1265	19.3235	19.6492	20.1594	20.5884	20.8838	20.9677	20.9526	20.7476	20.2140	19.6300	19.1461	(87)
Th 2	19.5905	19.5992	19.6079	19.6517	19.6605	19.7050	19.7050	19.7140	19.6872	19.6605	19.6429	19.6253	(88)
util rest of house	0.9902	0.9842	0.9713	0.9279	0.8191	0.6061	0.4087	0.4660	0.7597	0.9423	0.9824	0.9916	(89)
MIT 2	17.9415	18.1429	18.4709	18.9971	19.3924	19.6548	19.6978	19.7019	19.5543	19.0640	18.4799	17.9860	(90)
Living area fraction										fLA = Living area / (4) =		0.5202	(91)
MIT	18.5579	18.7570	19.0838	19.6017	20.0146	20.2941	20.3584	20.3525	20.1750	19.6622	19.0782	18.5895	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5579	18.7570	19.0838	19.6017	20.0146	20.2941	20.3584	20.3525	20.1750	19.6622	19.0782	18.5895	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9876	0.9808	0.9675	0.9269	0.8352	0.6589	0.4875	0.5449	0.7952	0.9423	0.9796	0.9893	(94)
Useful gains	434.0926	478.4081	505.7274	534.4833	516.2102	405.7234	285.3880	293.3900	391.9499	421.9940	417.8245	419.2448	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1232.6964	1189.3032	1072.0966	878.0199	676.9263	445.6402	294.1441	306.8440	483.1074	737.7958	990.2954	1207.7922	(97)
Space heating kWh	594.1612	477.7215	421.3787	247.3463	119.5728	0.0000	0.0000	0.0000	0.0000	234.9565	412.1790	586.6792	(98a)
Space heating requirement - total per year (kWh/year)												3093.9952	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	594.1612	477.7215	421.3787	247.3463	119.5728	0.0000	0.0000	0.0000	0.0000	234.9565	412.1790	586.6792	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3093.9952	
Space heating per m2											(98c) / (4) =	58.3773	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	84.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	594.1612	477.7215	421.3787	247.3463	119.5728	0.0000	0.0000	0.0000	0.0000	234.9565	412.1790	586.6792	(98)
Space heating efficiency (main heating system 1)	84.4000	84.4000	84.4000	84.4000	84.4000	0.0000	0.0000	0.0000	0.0000	84.4000	84.4000	84.4000	(210)
Space heating fuel (main heating system)	703.9825	566.0207	499.2638	293.0644	141.6739	0.0000	0.0000	0.0000	0.0000	278.3845	488.3638	695.1176	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	246.9592	218.6149	232.3789	204.1604	197.9024	178.2813	175.7162	182.5840	184.5057	205.8328	219.0451	244.2030	(64)
Efficiency of water heater												89.4000	(216)
(217)m	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	(217)
Fuel for water heating, kWh/month	276.2407	244.5357	259.9317	228.3674	221.3673	199.4198	196.5506	204.2327	206.3822	230.2380	245.0169	273.1578	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	21.6589	19.5629	21.6589	20.9602	21.6589	20.9602	21.6589	21.6589	20.9602	21.6589	20.9602	21.6589	(231)
Lighting	16.6964	13.3945	12.0603	8.8359	6.8251	5.5762	6.2261	8.0929	10.5118	13.7921	15.5782	17.1605	(232)

Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 3665.8711 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 89.4000
Water heating fuel used 2785.4407 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.7000, SFP = 1.0540)
mechanical ventilation fans (SFP = 1.0540) 169.0161 (230a)
central heating pump 41.0000 (230c)
main heating flue fan 45.0000 (230e)
Total electricity for the above, kWh/year 255.0161 (231)
Electricity for lighting (calculated in Appendix L) 134.7499 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 6841.0778 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3665.8711	0.2100	769.8329	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2785.4407	0.2100	584.9425	(264)
Space and water heating			1354.7755	(265)
Pumps, fans and electric keep-hot	255.0161	0.1387	35.3739	(267)
Energy for lighting	134.7499	0.1443	19.4486	(268)
Total CO2, kg/year			1409.5979	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			26.6000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3665.8711	1.1300	4142.4344	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2785.4407	1.1300	3147.5479	(278)
Space and water heating			7289.9823	(279)
Pumps, fans and electric keep-hot	255.0161	1.5128	385.7883	(281)
Energy for lighting	134.7499	1.5338	206.6839	(282)
Total Primary energy kWh/year			7882.4545	(286)
Dwelling Primary energy Rate (DPER)			148.7300	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	53.0000 (1b)	x	2.4800 (2b)	=	131.4400 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 53.0000						(4)

Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 131.4400 (5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1522	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4022	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3117	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3974	0.3896	0.3818	0.3428	0.3351	0.2961	0.2961	0.2883	0.3117	0.3351	0.3506	0.3662	(22b)
Effective ac	0.5790	0.5759	0.5729	0.5588	0.5561	0.5438	0.5438	0.5416	0.5486	0.5561	0.5615	0.5671	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			10.8900	1.1450	12.4695			(27)
External Wall 1	49.7000	12.7800	36.9200	0.1800	6.6456			(29a)
Sheltered Wall	15.8200		15.8200	0.1800	2.8476			(29a)
Total net area of external elements Aum(A, m2)			65.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.8527			(33)
Party Wall 1			22.7900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	3.2760	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	27.1287	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.1124	24.9794	24.8490	24.2368	24.1222	23.5889	23.5889	23.4902	23.7944	24.1222	24.3540	24.5962	(38)
Heat transfer coeff	52.2411	52.1081	51.9777	51.3654	51.2509	50.7176	50.7176	50.6189	50.9230	51.2509	51.4826	51.7249	(39)
Average = Sum(39)m / 12 =												51.3649	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9857	0.9832	0.9807	0.9692	0.9670	0.9569	0.9569	0.9551	0.9608	0.9670	0.9714	0.9759	(40)
HLP (average)												0.9691	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7786	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
54.0401	53.2280	52.0446	49.7804	48.1094	46.2459	45.1868	46.3612	47.6487	49.6494	51.9623	53.8331	(42a)

Hot water usage for baths

23.3623	23.0153	22.5267	21.6258	20.9512	20.2033	19.7992	20.2844	20.8127	21.6131	22.5325	23.2833	(42b)

Hot water usage for other uses

32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442	(42c)

Average daily hot water use (litres/day)	101.3421	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.2466	107.8932	105.0269	100.6674	97.1275	93.3218	91.8586	94.7125	97.7226	101.7180	106.1447	109.9606	(44)
Energy conte	174.6037	153.6385	161.4224	137.8086	130.7523	114.7500	111.0950	117.2739	120.5017	138.0304	151.2226	172.1717	(45)
Energy content (annual)										Total = Sum(45)m =		1683.2709	

Distribution loss (46)m = 0.15 x (45)m

26.1906	23.0458	24.2134	20.6713	19.6128	17.2125	16.6642	17.5911	18.0753	20.7046	22.6834	25.8258	(46)

Water storage loss:

Total storage loss
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)
If cylinder contains dedicated solar storage
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)
Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)
Combi loss 50.9589 46.0274 50.9589 49.3151 49.4951 46.0217 46.8101 48.2645 48.1919 50.9589 49.3151 50.9589 (61)
Total heat required for water heating calculated for each month
225.5626 199.6659 212.3813 187.1237 180.2475 160.7717 157.9051 165.5384 168.6936 188.9893 200.5377 223.1306 (62)
WWHRS -24.7049 -21.8492 -22.8792 -18.9449 -17.6560 -15.1083 -14.1617 -15.0595 -15.6317 -18.4280 -20.8767 -24.2474 (63a)
PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 (63b)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)
FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)
Output from w/h
200.8577 177.8167 189.5021 168.1788 162.5915 145.6633 143.7434 150.4789 153.0620 170.5613 179.6609 198.8832 (64)
Total per year (kWh/year) = Sum(64)m = 2040.9999 (64)
12Total per year (kWh/year) 2041 (64)
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
70.7955 62.5917 66.4127 58.1501 55.8489 49.6598 48.6416 51.0597 52.1148 58.6348 62.6103 69.9868 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	78.5370	86.9517	78.5370	81.1549	78.5370	81.1549	78.5370	78.5370	81.1549	78.5370	81.1549	78.5370	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	(71)

Water heating gains (Table 5)

	95.1552	93.1423	89.2643	80.7641	75.0658	68.9719	65.3785	68.6286	72.3817	78.8103	86.9587	94.0683	(72)

Total internal gains

	381.3884	389.3988	373.0525	358.5405	339.3309	322.6167	309.5655	311.2070	321.6316	337.0720	358.7317	373.4617	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.2400	10.6334	0.6300	0.7000	0.7700	30.0273	(74)
Southeast	1.6500	36.7938	0.6300	0.7000	0.7700	18.5537	(77)

Solar gains	48.5810	88.9875	140.7505	210.2027	270.9996	285.4464	268.3166	219.9437	164.0588	103.2367	59.2656	40.9103	(83)
Total gains	429.9694	478.3863	513.8031	568.7432	610.3304	608.0631	577.8821	531.1508	485.6904	440.3087	417.9973	414.3720	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.4533	70.6331	70.8103	71.6543	71.8145	72.5696	72.5696	72.7112	72.2769	71.8145	71.4912	71.1564	
alpha	5.6969	5.7089	5.7207	5.7770	5.7876	5.8380	5.8380	5.8474	5.8185	5.7876	5.7661	5.7438	
util living area	0.9909	0.9822	0.9615	0.8875	0.7307	0.5274	0.3852	0.4364	0.6893	0.9208	0.9808	0.9925	(86)
MIT	20.0693	20.2301	20.4581	20.7558	20.9358	20.9918	20.9989	20.9978	20.9652	20.7331	20.3610	20.0439	(87)
Th 2	20.0953	20.0974	20.0994	20.1091	20.1109	20.1194	20.1194	20.1209	20.1161	20.1109	20.1073	20.1034	(88)
util rest of house	0.9882	0.9769	0.9501	0.8576	0.6757	0.4577	0.3087	0.3541	0.6141	0.8923	0.9741	0.9902	(89)
MIT 2	19.0244	19.2287	19.5138	19.8730	20.0608	20.1150	20.1190	20.1202	20.0944	19.8571	19.4031	18.9984	(90)
Living area fraction									fLA = Living area / (4) =			0.5202	(91)
MIT	19.5679	19.7496	20.0050	20.3322	20.5159	20.5711	20.5767	20.5767	20.5474	20.3128	19.9014	19.5423	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5679	19.7496	20.0050	20.3322	20.5159	20.5711	20.5767	20.5767	20.5474	20.3128	19.9014	19.5423	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9861	0.9745	0.9487	0.8657	0.7015	0.4937	0.3485	0.3969	0.6519	0.8996	0.9722	0.9884	(94)
Useful gains	424.0091	466.1706	487.4598	492.3688	428.1633	300.2187	201.4081	210.8361	316.6105	396.0876	406.3943	409.5719	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													

	797.6138	773.7842	701.9603	587.2189	451.8246	302.8382	201.6897	211.4197	328.3198	497.7879	659.0503	793.5776 (97)
Space heating kWh												
	277.9619	206.7163	159.5883	68.2921	17.6040	0.0000	0.0000	0.0000	0.0000	75.6650	181.9123	285.7003 (98a)
Space heating requirement - total per year (kWh/year)												1273.4402
Solar heating kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh												
	277.9619	206.7163	159.5883	68.2921	17.6040	0.0000	0.0000	0.0000	0.0000	75.6650	181.9123	285.7003 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1273.4402
Space heating per m2											(98c) / (4) =	24.0272 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	277.9619	206.7163	159.5883	68.2921	17.6040	0.0000	0.0000	0.0000	0.0000	75.6650	181.9123	285.7003	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	300.8246	223.7190	172.7146	73.9092	19.0519	0.0000	0.0000	0.0000	0.0000	81.8885	196.8748	309.1994	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	200.8577	177.8167	189.5021	168.1788	162.5915	145.6633	143.7434	150.4789	153.0620	170.5613	179.6609	198.8832	(64)
Efficiency of water heater													
(217)m	85.0778	84.7050	84.0155	82.6079	81.0661	80.3000	80.3000	80.3000	80.3000	82.7602	84.4082	85.1569	(217)
Fuel for water heating, kWh/month													
	236.0872	209.9246	225.5560	203.5869	200.5665	181.3989	179.0080	187.3958	190.6127	206.0909	212.8479	233.5492	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.3184	13.0913	11.7872	8.6358	6.6706	5.4499	6.0851	7.9097	10.2739	13.4799	15.2255	16.7720	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.3310	-21.3036	-32.2760	-38.3272	-43.1436	-40.9579	-40.4780	-37.3177	-32.0514	-25.2615	-16.1474	-12.2665	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.0696	-10.9077	-22.1337	-33.9122	-45.4902	-45.9268	-45.3673	-38.0984	-27.5284	-15.7960	-6.8329	-3.9897	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1378.1821 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	2466.6246 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	131.6991 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-654.9144 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3407.5913 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1378.1821	0.2100	289.4182	(261)
Total CO2 associated with community systems			0.0000	(373)

Water heating (other fuel)	2466.6246	0.2100	517.9912 (264)
Space and water heating			807.4094 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	131.6991	0.1443	19.0083 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-353.8617	0.1335	-47.2296
PV Unit electricity exported	-301.0527	0.1253	-37.7302
Total			-84.9598 (269)
Total CO2, kg/year			753.3871 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.2100 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1378.1821	1.1300	1557.3457 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2466.6246	1.1300	2787.2858 (278)
Space and water heating			4344.6315 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	131.6991	1.5338	202.0045 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-353.8617	1.4932	-528.3918
PV Unit electricity exported	-301.0527	0.4600	-138.4878
Total			-666.8795 (283)
Total Primary energy kWh/year			4009.8573 (286)
Target Primary Energy Rate (TPER)			75.6600 (287)

Full SAP Calculation Printout

Property Reference	3.F Flat - 10-12 Museum Street	Issued on Date	06/05/2023
Assessment Reference	00001	Prop Type Ref	Flat - 10-12 Museum Street
Property	Museum Street, London, WC1A		

SAP Rating	76 C	DER	28.54	TER	14.85
Environmental	80 C	% DER < TER			-92.19
CO_2 Emissions (t/year)	1.22	DFEE	75.21	TFEE	33.20
Compliance Check	See BREL	% DFEE < TFEE			-126.56
% DPER < TPER	-101.25	DPER	159.16	TPER	79.09

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.0000	(1b)	x 2.4600	(2b) =	127.9200	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		127.9200	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.7500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5813	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.7411	0.7266	0.7120	0.6394	0.6248	0.5522	0.5522	0.5377	0.5813	0.6248	0.6539	0.6830	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	84.6000 (23c)

Effective ac	0.8181	0.8036	0.7890	0.7164	0.7018	0.6292	0.6292	0.6147	0.6583	0.7018	0.7309	0.7600	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.60)			11.5800	1.5038	17.4135			(27)
Solid Door			1.8900	3.0000	5.6700			(26)
External Wall 1	46.3500	13.4700	32.8800	0.3000	9.8640			(29a)

External Roof 1	52.0000	52.0000	0.1600	8.3200	(30)
Total net area of external elements Aum(A, m2)		98.3500			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		41.2675	(33)
Party Wall 1		30.4800	0.0000	0.0000	(32)
Party Floor 1		52.0000			(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		19.6700 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	60.9375 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.5347	33.9213	33.3078	30.2408	29.6274	26.5603	26.5603	25.9469	27.7871	29.6274	30.8542	32.0810	(38)
Heat transfer coeff	95.4722	94.8588	94.2454	91.1783	90.5649	87.4978	87.4978	86.8844	88.7246	90.5649	91.7917	93.0186	(39)
Average = Sum(39)m / 12 =												91.0249	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8360	1.8242	1.8124	1.7534	1.7416	1.6827	1.6827	1.6709	1.7062	1.7416	1.7652	1.7888	(40)
HLP (average)												1.7505	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7491	(42)
Hot water usage for mixer showers	66.9321	65.9262	64.4605	61.6561	59.5865	57.2785	55.9666	57.4213	59.0158	61.4939	64.3586	66.6756	(42a)
Hot water usage for baths	23.1496	22.8058	22.3217	21.4290	20.7606	20.0194	19.6190	20.0998	20.6232	21.4163	22.3274	23.0714	(42b)
Hot water usage for other uses	32.5422	31.3589	30.1755	28.9922	27.8088	26.6255	26.6255	27.8088	28.9922	30.1755	31.3589	32.5422	(42c)
Average daily hot water use (litres/day)												112.7563	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.6239	120.0909	116.9577	112.0772	108.1559	103.9233	102.2111	105.3299	108.6313	113.0858	118.0449	122.2892	(44)
Energy conte	194.2064	171.0079	179.7596	153.4281	145.5986	127.7859	123.6155	130.4204	133.9532	153.4563	168.1765	191.4754	(45)
Energy content (annual)										Total = Sum(45)m =		1872.8838	
Distribution loss (46)m = 0.15 x (45)m	29.1310	25.6512	26.9639	23.0142	21.8398	19.1679	18.5423	19.5631	20.0930	23.0185	25.2265	28.7213	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	245.1653	217.0353	230.7185	202.7432	196.5575	177.1009	174.5744	181.3793	183.2683	204.4152	217.4916	242.4343	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	245.1653	217.0353	230.7185	202.7432	196.5575	177.1009	174.5744	181.3793	183.2683	204.4152	217.4916	242.4343	(64)
										Total per year (kWh/year) = Sum(64)m =		2472.8838	(64)
12Total per year (kWh/year)												2473	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	77.3133	68.3670	72.5098	63.3436	61.1513	54.8176	53.8419	56.1045	56.8682	63.7640	68.2475	76.4053	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8832	85.1207	76.8832	79.4460	76.8832	79.4460	76.8832	76.8832	79.4460	76.8832	79.4460	76.8832	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)	103.9158	101.7366	97.4594	87.9773	82.1925	76.1355	72.3681	75.4093	78.9836	85.7042	94.7881	102.6953	(72)
Total internal gains	385.4610	393.1010	376.6005	361.1957	342.1369	325.5756	312.5200	313.9795	324.1024	339.7456	362.1036	377.5151	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	8.1100	11.2829	0.6300	0.7000	0.7700	27.9650 (75)
Southwest	3.4700	36.7938	0.6300	0.7000	0.7700	39.0190 (79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9840	123.3874	193.4969	281.1075	352.6112	366.6650	346.5945	290.7111	223.4362	143.0218	81.9230	56.2298	(83)
Total gains	452.4450	516.4884	570.0974	642.3032	694.7481	692.2406	659.1145	604.6906	547.5386	482.7675	444.0266	433.7448	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.8237	38.0683	38.3161	39.6049	39.8732	41.2709	41.2709	41.5623	40.7002	39.8732	39.3403	38.8214	
alpha	3.5216	3.5379	3.5544	3.6403	3.6582	3.7514	3.7514	3.7708	3.7133	3.6582	3.6227	3.5881	
util living area	0.9915	0.9856	0.9734	0.9365	0.8538	0.6990	0.5491	0.6064	0.8294	0.9558	0.9856	0.9927	(86)
MIT	18.9003	19.1306	19.5070	20.0681	20.5364	20.8570	20.9566	20.9378	20.7042	20.1059	19.4461	18.9094	(87)
Th 2	19.4449	19.4531	19.4613	19.5028	19.5111	19.5533	19.5533	19.5618	19.5364	19.5111	19.4944	19.4778	(88)
util rest of house	0.9885	0.9805	0.9633	0.9109	0.7924	0.5808	0.3849	0.4413	0.7353	0.9325	0.9796	0.9901	(89)
MIT 2	17.6148	17.8483	18.2245	18.7939	19.2191	19.4944	19.5444	19.5470	19.3871	18.8471	18.1917	17.6466	(90)
Living area fraction										fLA = Living area / (4) =		0.4683	(91)
MIT	18.2168	18.4487	18.8251	19.3906	19.8360	20.1325	20.2057	20.1983	20.0038	19.4365	18.7791	18.2379	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2168	18.4487	18.8251	19.3906	19.8360	20.1325	20.2057	20.1983	20.0038	19.4365	18.7791	18.2379	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9850	0.9758	0.9578	0.9085	0.8078	0.6320	0.4624	0.5190	0.7701	0.9310	0.9755	0.9871	(94)
Useful gains	445.6758	504.0104	546.0261	583.5361	561.2134	437.5226	304.7971	313.8351	421.6324	449.4559	433.1664	428.1566	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1328.6640	1285.2176	1161.5811	956.5121	736.8338	484.0780	315.4891	330.0140	523.8163	800.2789	1072.0441	1305.7884	(97)
Space heating kWh	656.9432	524.9712	457.9729	268.5427	130.6615	0.0000	0.0000	0.0000	0.0000	261.0123	459.9919	652.9580	(98a)
Space heating requirement - total per year (kWh/year)												3413.0538	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	656.9432	524.9712	457.9729	268.5427	130.6615	0.0000	0.0000	0.0000	0.0000	261.0123	459.9919	652.9580	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3413.0538	
Space heating per m2											(98c) / (4) =	65.6356	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 84.4000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	656.9432	524.9712	457.9729	268.5427	130.6615	0.0000	0.0000	0.0000	0.0000	261.0123	459.9919	652.9580	(98)
Space heating efficiency (main heating system 1)	84.4000	84.4000	84.4000	84.4000	84.4000	0.0000	0.0000	0.0000	0.0000	84.4000	84.4000	84.4000	(210)
Space heating fuel (main heating system)	778.3687	622.0038	542.6219	318.1786	154.8122	0.0000	0.0000	0.0000	0.0000	309.2562	545.0141	773.6470	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	245.1653	217.0353	230.7185	202.7432	196.5575	177.1009	174.5744	181.3793	183.2683	204.4152	217.4916	242.4343	(64)
Efficiency of water heater												89.4000	(216)
(217)m	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	(217)
Fuel for water heating, kWh/month	274.2341	242.7688	258.0744	226.7821	219.8630	198.0995	195.2734	202.8851	204.9981	228.6524	243.2792	271.1793	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	21.2745	19.2157	21.2745	20.5882	21.2745	20.5882	21.2745	21.2745	20.5882	21.2745	20.5882	21.2745	(231)
Lighting	16.3449	13.1125	11.8063	8.6498	6.6814	5.4587	6.0950	7.9225	10.2905	13.5017	15.2501	16.7991	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													

(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	4043.9026 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	89.4000
Water heating fuel used	2766.0893 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.7000, SFP = 1.0540)	
mechanical ventilation fans (SFP = 1.0540)	164.4898 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	250.4898 (231)
Electricity for lighting (calculated in Appendix L)	131.9124 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	7192.3941 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4043.9026	0.2100	849.2195	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2766.0893	0.2100	580.8787	(264)
Space and water heating			1430.0983	(265)
Pumps, fans and electric keep-hot	250.4898	0.1387	34.7460	(267)
Energy for lighting	131.9124	0.1443	19.0390	(268)
Total CO2, kg/year			1483.8833	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			28.5400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4043.9026	1.1300	4569.6099	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2766.0893	1.1300	3125.6809	(278)
Space and water heating			7695.2908	(279)
Pumps, fans and electric keep-hot	250.4898	1.5128	378.9409	(281)
Energy for lighting	131.9124	1.5338	202.3317	(282)
Total Primary energy kWh/year			8276.5634	(286)
Dwelling Primary energy Rate (DPER)			159.1600	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		52.0000 (1b)	x	2.4600 (2b)	=	127.9200 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	127.9200	(5)

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2. Ventilation rate
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			m3 per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
			Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1563 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.4063 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3149 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4015	0.3936	0.3858	0.3464	0.3385	0.2992	0.2992	0.2913	0.3149	0.3385	0.3543	0.3700	(22b)
Effective ac	0.5806	0.5775	0.5744	0.5600	0.5573	0.5448	0.5448	0.5424	0.5496	0.5573	0.5628	0.5685	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			11.1100	1.1450	12.7214			(27)
External Wall 1	46.3500	13.0000	33.3500	0.1800	6.0030			(29a)
External Roof 1	52.0000		52.0000	0.1100	5.7200			(30)
Total net area of external elements Aum(A, m2)			98.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.3344			(33)
Party Wall 1			30.4800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		4.9175 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	31.2519 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.5096	24.3775	24.2480	23.6396	23.5258	22.9960	22.9960	22.8978	23.2001	23.5258	23.7561	23.9968	(38)
Heat transfer coeff	55.7615	55.6294	55.4999	54.8915	54.7777	54.2478	54.2478	54.1497	54.4519	54.7777	55.0079	55.2487	(39)
Average = Sum(39)m / 12 =												54.8910	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0723	1.0698	1.0673	1.0556	1.0534	1.0432	1.0432	1.0413	1.0472	1.0534	1.0578	1.0625	(40)
HLP (average)												1.0556	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.7491 (42)
Hot water usage for mixer showers		
53.5457 52.7410 51.5684 49.3249 47.6692 45.8228 44.7733 45.9370 47.2127 49.1951 51.4869 53.3405		(42a)
Hot water usage for baths		
23.1496 22.8058 22.3217 21.4290 20.7606 20.0194 19.6190 20.0998 20.6232 21.4163 22.3274 23.0714		(42b)
Hot water usage for other uses		
32.5422 31.3589 30.1755 28.9922 27.8088 26.6255 26.6255 27.8088 28.9922 30.1755 31.3589 32.5422		(42c)
Average daily hot water use (litres/day)		100.4145 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.2375	106.9057	104.0656	99.7460	96.2386	92.4676	91.0178	93.8456	96.8281	100.7870	105.1731	108.9541	(44)
Energy conte	173.0055	152.2323	159.9449	136.5473	129.5556	113.6997	110.0781	116.2005	119.3987	136.7670	149.8384	170.5958	(45)
Energy content (annual)										Total = Sum(45)m =		1667.8640	
Distribution loss (46)m = 0.15 x (45)m	25.9508	22.8348	23.9917	20.4821	19.4333	17.0550	16.5117	17.4301	17.9098	20.5151	22.4758	25.5894	(46)
Water storage loss:													
Total storage loss													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.1898	49.0421	45.6005	46.3817	47.8227	47.7508	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	223.9644	198.2597	210.9038	185.7371	178.5977	159.3002	156.4598	164.0232	167.1496	187.7259	199.1535	221.5547 (62)
WWHRS	-24.4788	-21.6493	-22.6699	-18.7716	-17.4944	-14.9701	-14.0321	-14.9217	-15.4886	-18.2594	-20.6857	-24.0255 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
	199.4856	176.6104	188.2340	166.9656	161.1033	144.3301	142.4277	149.1015	151.6609	169.4665	178.4678	197.5292 (64)
										Total per year (kWh/year) = Sum(64)m =		2025.3825 (64)
12Total per year (kWh/year)												2025 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month												
	70.2641	62.1241	65.9214	57.6994	55.3378	49.2053	48.1964	50.5923	51.6378	58.2148	62.1500	69.4628 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	87.4535	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.0079	85.2588	77.0079	79.5748	77.0079	79.5748	77.0079	77.0079	79.5748	77.0079	79.5748	77.0079	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	152.4259	154.0076	150.0218	141.5364	130.8251	120.7580	114.0326	112.4509	116.4367	124.9221	135.6334	145.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	31.7454	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	-69.9628	(71)
Water heating gains (Table 5)													
	94.4410	92.4465	88.6041	80.1381	74.3787	68.3407	64.7801	68.0005	71.7191	78.2456	86.3195	93.3640	(72)
Total internal gains													
	376.1109	383.9490	367.8698	353.4854	334.4478	317.9096	305.0567	306.6953	316.9668	332.4117	353.7638	368.3085	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.7800	11.2829	0.6300	0.7000	0.7700	26.8271	(75)
Southwest	3.3300	36.7938	0.6300	0.7000	0.7700	37.4448	(79)

Solar gains	64.2719	118.3896	185.6548	269.7079	338.3067	351.7884	332.5330	278.9201	214.3784	137.2275	78.6056	53.9533	(83)
Total gains	440.3827	502.3386	553.5246	623.1933	672.7546	669.6981	637.5897	585.6154	531.3452	469.6392	432.3694	422.2618	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.7599	64.9137	65.0652	65.7863	65.9230	66.5669	66.5669	66.6875	66.3174	65.9230	65.6471	65.3611	
alpha	5.3173	5.3276	5.3377	5.3858	5.3949	5.4378	5.4378	5.4458	5.4212	5.3949	5.3765	5.3574	
util living area													
	0.9901	0.9793	0.9533	0.8690	0.7079	0.5113	0.3732	0.4230	0.6716	0.9126	0.9792	0.9919	(86)
MIT	19.9645	20.1555	20.4201	20.7427	20.9303	20.9900	20.9985	20.9971	20.9604	20.7040	20.2845	19.9330	(87)
Th 2	20.0235	20.0256	20.0276	20.0373	20.0391	20.0475	20.0475	20.0490	20.0442	20.0391	20.0354	20.0316	(88)
util rest of house													
	0.9870	0.9732	0.9396	0.8352	0.6495	0.4384	0.2931	0.3368	0.5923	0.8812	0.9719	0.9894	(89)
MIT 2	18.8373	19.0791	19.4081	19.7927	19.9857	20.0422	20.0470	20.0481	20.0200	19.7612	19.2516	18.8035	(90)
Living area fraction										fLA = Living area / (4) =		0.4683	(91)
MIT	19.3651	19.5831	19.8820	20.2376	20.4280	20.4860	20.4926	20.4925	20.4604	20.2026	19.7353	19.3324	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3651	19.5831	19.8820	20.2376	20.4280	20.4860	20.4926	20.4925	20.4604	20.2026	19.7353	19.3324	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9844	0.9697	0.9372	0.8428	0.6740	0.4723	0.3306	0.3772	0.6280	0.8872	0.9691	0.9871	(94)
Useful gains	433.5082	487.1268	518.7764	525.2404	453.4105	316.3027	210.8160	220.9125	333.6762	416.6848	418.9898	416.8099	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	840.0538	816.8134	742.6971	622.3369	478.1011	319.3045	211.1631	221.6069	346.3341	526.0106	695.0407	836.0455	(97)

Space heating kWh
302.4699 221.5494 166.5970 69.9095 18.3698 0.0000 0.0000 0.0000 0.0000 81.3384 198.7567 311.9113 (98a)
Space heating requirement - total per year (kWh/year) 1370.9019
Solar heating kWh
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (98b)
Solar heating contribution - total per year (kWh/year) 0.0000
Space heating kWh
302.4699 221.5494 166.5970 69.9095 18.3698 0.0000 0.0000 0.0000 0.0000 81.3384 198.7567 311.9113 (98c)
Space heating requirement after solar contribution - total per year (kWh/year) 1370.9019
Space heating per m2 (98c) / (4) = 26.3635 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.4000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	302.4699	221.5494	166.5970	69.9095	18.3698	0.0000	0.0000	0.0000	0.0000	81.3384	198.7567	311.9113	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	327.3484	239.7721	180.2998	75.6596	19.8807	0.0000	0.0000	0.0000	0.0000	88.0286	215.1046	337.5663	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	199.4856	176.6104	188.2340	166.9656	161.1033	144.3301	142.4277	149.1015	151.6609	169.4665	178.4678	197.5292	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.2707	84.8683	84.1207	82.6600	81.1030	80.3000	80.3000	80.3000	80.3000	82.9008	84.6128	85.3555	(217)
Fuel for water heating, kWh/month													
	233.9440	208.0993	223.7665	201.9908	198.6403	179.7386	177.3695	185.6805	188.8679	204.4207	210.9231	231.4193	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.0007	12.8364	11.5577	8.4677	6.5407	5.3438	5.9666	7.7557	10.0738	13.2174	14.9290	16.4454	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.0683	-20.9172	-31.6975	-37.6496	-42.3904	-40.2476	-39.7772	-36.6675	-31.4861	-24.8082	-15.8531	-12.0411	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-4.9663	-10.6863	-21.6856	-33.2268	-44.5711	-44.9977	-44.4484	-37.3257	-26.9695	-15.4746	-6.6935	-3.9083	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 1483.6601 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 80.3000
Water heating fuel used 2444.8606 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
Total electricity for the above, kWh/year 86.0000 (231)
Electricity for lighting (calculated in Appendix L) 129.1350 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -642.5576 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 3501.0981 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1483.6601	0.2100	311.5686	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2444.8606	0.2100	513.4207	(264)

Space and water heating			824.9893 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	129.1350	0.1443	18.6382 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-347.6038	0.1335	-46.3925
PV Unit electricity exported	-294.9537	0.1253	-36.9657
Total			-83.3582 (269)
Total CO2, kg/year			772.1985 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.8500 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1483.6601	1.1300	1676.5359 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2444.8606	1.1300	2762.6924 (278)
Space and water heating			4439.2284 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	129.1350	1.5338	198.0716 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-347.6038	1.4932	-519.0405
PV Unit electricity exported	-294.9537	0.4600	-135.6819
Total			-654.7223 (283)
Total Primary energy kWh/year			4112.6784 (286)
Target Primary Energy Rate (TPER)			79.0900 (287)

Full SAP Calculation Printout

Property Reference	3.F Flat - 39-41 Oxford Street	Issued on Date	06/05/2023
Assessment Reference	00001	Prop Type Ref	Flat - 10-12 Museum Street
Property	Museum Street, London, WC1A		

SAP Rating	75 C	DER	29.91	TER	15.39
Environmental	79 C	% DER < TER			-94.35
CO_2 Emissions (t/year)	1.3	DFEE	80.71	TFEE	35.27
Compliance Check	See BREL	% DFEE < TFEE			-128.85
% DPER < TPER	-103.05	DPER	166.54	TPER	82.02

Assessor Details	Mr. Adrian Fell	Assessor ID	N222-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	53.0000	(1b)	x 2.4000	(2b) =	127.2000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		127.2000	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.7500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5813 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.7411	0.7266	0.7120	0.6394	0.6248	0.5522	0.5522	0.5377	0.5813	0.6248	0.6539	0.6830	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	84.6000 (23c)

Effective ac	0.8181	0.8036	0.7890	0.7164	0.7018	0.6292	0.6292	0.6147	0.6583	0.7018	0.7309	0.7600	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.60)			8.7100	1.5038	13.0977			(27)
Solid Door			1.8900	3.0000	5.6700			(26)
External Wall 1	44.0900	10.6000	33.4900	0.3000	10.0470			(29a)

Sheltered Wall	14.0400	14.0400	0.3000	4.2120		(29a)
External Roof 1	53.0000	53.0000	0.1600	8.4800		(30)
Total net area of external elements Aum(A, m2)		111.1300				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		41.5067		(33)
Party Wall 1		20.2200	0.0000	0.0000		(32)
Party Floor 1		53.0000				(32d)
Party Ceiling 1		53.0000				(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		22.2260 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	63.7327 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.3403	33.7303	33.1204	30.0706	29.4606	26.4108	26.4108	25.8008	27.6307	29.4606	30.6805	31.9004	(38)
Heat transfer coeff	98.0730	97.4631	96.8531	93.8033	93.1933	90.1435	90.1435	89.5336	91.3634	93.1933	94.4133	95.6332	(39)
Average = Sum(39)m / 12 =												93.6508	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8504	1.8389	1.8274	1.7699	1.7584	1.7008	1.7008	1.6893	1.7238	1.7584	1.7814	1.8044	(40)
HLP (average)												1.7670	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7786 (42)

Hot water usage for mixer showers

67.5502	66.5350	65.0557	62.2254	60.1367	57.8074	56.4835	57.9515	59.5608	62.0618	64.9529	67.2914	(42a)

Hot water usage for baths

23.3623	23.0153	22.5267	21.6258	20.9512	20.2033	19.7992	20.2844	20.8127	21.6131	22.5325	23.2833	(42b)

Hot water usage for other uses

32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442	(42c)

Average daily hot water use (litres/day) 113.7979 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.7567	121.2002	118.0380	113.1125	109.1549	104.8833	103.1553	106.3028	109.6347	114.1304	119.1353	123.4189	(44)
Energy conte	196.0003	172.5875	181.4200	154.8453	146.9435	128.9662	124.7573	131.6251	135.1906	154.8739	169.7300	193.2441	(45)
Energy content (annual)										Total = Sum(45)m =		1890.1839	
Distribution loss (46)m = 0.15 x (45)m	29.4000	25.8881	27.2130	23.2268	22.0415	19.3449	18.7136	19.7438	20.2786	23.2311	25.4595	28.9866	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	246.9592	218.6149	232.3789	204.1604	197.9024	178.2813	175.7162	182.5840	184.5057	205.8328	219.0451	244.2030	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	246.9592	218.6149	232.3789	204.1604	197.9024	178.2813	175.7162	182.5840	184.5057	205.8328	219.0451	244.2030	(64)
									Total per year (kWh/year) = Sum(64)m =			2490.1839	(64)
12Total per year (kWh/year)												2490	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					0.0000	(64a)
Heat gains from water heating, kWh/month	77.9098	68.8922	73.0619	63.8148	61.5984	55.2100	54.2215	56.5051	57.2796	64.2353	68.7640	76.9934	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.1502	89.8448	81.1502	83.8552	81.1502	83.8552	81.1502	81.1502	83.8552	81.1502	83.8552	81.1502	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	(71)
Water heating gains (Table 5)	104.7175	102.5181	98.2015	88.6317	82.7936	76.6806	72.8784	75.9477	79.5550	86.3378	95.5056	103.4858	(72)
Total internal gains	393.5639	401.6678	384.6028	369.1084	349.6718	333.0256	319.6786	321.1393	331.5053	347.2126	369.9789	385.4923	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	7.2200	10.6334	0.6300	0.7000	0.7700	23.4629 (74)
Southeast	1.4900	36.7938	0.6300	0.7000	0.7700	16.7546 (77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	40.2174	73.3779	115.2405	170.7669	219.0553	230.2911	216.6459	178.2642	133.8888	84.9166	49.0126	33.8982	(83)
Total gains	433.7813	475.0457	499.8434	539.8753	568.7271	563.3167	536.3245	499.4035	465.3940	432.1292	418.9914	419.3905	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.5287	37.7636	38.0014	39.2370	39.4938	40.8300	40.8300	41.1081	40.2848	39.4938	38.9835	38.4862	
alpha	3.5019	3.5176	3.5334	3.6158	3.6329	3.7220	3.7220	3.7405	3.6857	3.6329	3.5989	3.5657	
util living area	0.9930	0.9895	0.9831	0.9631	0.9133	0.7975	0.6570	0.7073	0.8873	0.9698	0.9888	0.9938	(86)
MIT	18.8348	19.0249	19.3563	19.8822	20.3676	20.7653	20.9187	20.8920	20.6018	19.9983	19.3709	18.8498	(87)
Th 2	19.4349	19.4429	19.4509	19.4912	19.4993	19.5402	19.5402	19.5485	19.5238	19.4993	19.4831	19.4669	(88)
util rest of house	0.9904	0.9857	0.9763	0.9465	0.8686	0.6876	0.4754	0.5335	0.8105	0.9529	0.9839	0.9916	(89)
MIT 2	17.5431	17.7372	18.0712	18.6142	19.0753	19.4336	19.5217	19.5200	19.3071	18.7389	18.1101	17.5800	(90)
Living area fraction										fLA = Living area / (4) =		0.5202	(91)
MIT	18.2150	18.4070	18.7397	19.2738	19.7476	20.1264	20.2484	20.2337	19.9806	19.3940	18.7660	18.2405	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2150	18.4070	18.7397	19.2738	19.7476	20.1264	20.2484	20.2337	19.9806	19.3940	18.7660	18.2405	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9876	0.9821	0.9721	0.9434	0.8775	0.7373	0.5705	0.6237	0.8391	0.9513	0.9807	0.9891	(94)
Useful gains	428.4045	466.5422	485.8936	509.3041	499.0862	415.3512	305.9999	311.4764	390.5222	411.0721	410.8854	414.8185	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1364.6867	1316.4348	1185.4484	973.0977	749.9800	498.1653	328.8782	343.2459	537.2707	819.5467	1101.4218	1342.7374	(97)
Space heating kWh	696.5940	571.1278	520.4687	333.9314	186.6650	0.0000	0.0000	0.0000	0.0000	303.9051	497.1862	690.3716	(98a)
Space heating requirement - total per year (kWh/year)												3800.2498	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	696.5940	571.1278	520.4687	333.9314	186.6650	0.0000	0.0000	0.0000	0.0000	303.9051	497.1862	690.3716	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3800.2498	
Space heating per m2										(98c) / (4) =		71.7028	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	84.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	696.5940	571.1278	520.4687	333.9314	186.6650	0.0000	0.0000	0.0000	0.0000	303.9051	497.1862	690.3716	(98)
Space heating efficiency (main heating system 1)	84.4000	84.4000	84.4000	84.4000	84.4000	0.0000	0.0000	0.0000	0.0000	84.4000	84.4000	84.4000	(210)
Space heating fuel (main heating system)	825.3483	676.6917	616.6691	395.6533	221.1670	0.0000	0.0000	0.0000	0.0000	360.0772	589.0831	817.9759	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	246.9592	218.6149	232.3789	204.1604	197.9024	178.2813	175.7162	182.5840	184.5057	205.8328	219.0451	244.2030	(64)
Efficiency of water heater												89.4000	(216)
(217)m	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	89.4000	(217)
Fuel for water heating, kWh/month	276.2407	244.5357	259.9317	228.3674	221.3673	199.4198	196.5506	204.2327	206.3822	230.2380	245.0169	273.1578	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	21.1958	19.1446	21.1958	20.5121	21.1958	20.5121	21.1958	21.1958	20.5121	21.1958	20.5121	21.1958	(231)

Lighting	17.2520	13.8402	12.4616	9.1299	7.0522	5.7617	6.4332	8.3622	10.8616	14.2510	16.0965	17.7315 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	4502.6657 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	89.4000
Water heating fuel used	2785.4407 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.7000, SFP = 1.0540)	
mechanical ventilation fans (SFP = 1.0540)	163.5639 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	249.5639 (231)
Electricity for lighting (calculated in Appendix L)	139.2334 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	7676.9037 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4502.6657	0.2100	945.5598	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2785.4407	0.2100	584.9425	(264)
Space and water heating			1530.5023	(265)
Pumps, fans and electric keep-hot	249.5639	0.1387	34.6176	(267)
Energy for lighting	139.2334	0.1443	20.0957	(268)
Total CO2, kg/year			1585.2156	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			29.9100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4502.6657	1.1300	5088.0122	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2785.4407	1.1300	3147.5479	(278)
Space and water heating			8235.5602	(279)
Pumps, fans and electric keep-hot	249.5639	1.5128	377.5403	(281)
Energy for lighting	139.2334	1.5338	213.5609	(282)
Total Primary energy kWh/year			8826.6614	(286)
Dwelling Primary energy Rate (DPER)			166.5400	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	53.0000 (1b)	x	2.4000 (2b)	=	127.2000 (1b)	-

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 53.0000 (4)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 127.2000 (5)

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2. Ventilation rate
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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1572	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4072	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3156	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4024	0.3945	0.3866	0.3472	0.3393	0.2998	0.2998	0.2919	0.3156	0.3393	0.3551	0.3708	(22b)
Effective ac	0.5810	0.5778	0.5747	0.5603	0.5576	0.5449	0.5449	0.5426	0.5498	0.5576	0.5630	0.5688	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			8.7100	1.1450	9.9733			(27)
External Wall 1	44.0900	10.6000	33.4900	0.1800	6.0282			(29a)
Sheltered Wall	14.0400		14.0400	0.1800	2.5272			(29a)
External Roof 1	53.0000		53.0000	0.1100	5.8300			(30)
Total net area of external elements Aum(A, m2)			111.1300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.2487			(33)
Party Wall 1			20.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	5.5565	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 31.8052	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.3864	24.2545	24.1251	23.5176	23.4039	22.8747	22.8747	22.7767	23.0785	23.4039	23.6338	23.8743	(38)
Heat transfer coeff	56.1916	56.0597	55.9303	55.3227	55.2091	54.6799	54.6799	54.5819	54.8837	55.2091	55.4390	55.6794	(39)
Average = Sum(39)m / 12 =												55.3222	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0602	1.0577	1.0553	1.0438	1.0417	1.0317	1.0317	1.0298	1.0355	1.0417	1.0460	1.0506	(40)
HLP (average)												1.0438	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7786	(42)
Hot water usage for mixer showers		
54.0401 53.2280 52.0446 49.7804 48.1094 46.2459 45.1868 46.3612 47.6487 49.6494 51.9623 53.8331		(42a)
Hot water usage for baths		
23.3623 23.0153 22.5267 21.6258 20.9512 20.2033 19.7992 20.2844 20.8127 21.6131 22.5325 23.2833		(42b)
Hot water usage for other uses		
32.8442 31.6499 30.4556 29.2612 28.0669 26.8726 26.8726 28.0669 29.2612 30.4556 31.6499 32.8442		(42c)
Average daily hot water use (litres/day)	101.3421	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.2466	107.8932	105.0269	100.6674	97.1275	93.3218	91.8586	94.7125	97.7226	101.7180	106.1447	109.9606	(44)
Energy conte	174.6037	153.6385	161.4224	137.8086	130.7523	114.7500	111.0950	117.2739	120.5017	138.0304	151.2226	172.1717	(45)
Energy content (annual)										Total = Sum(45)m =		1683.2709	

Distribution loss (46)m = 0.15 x (45)m

	26.1906	23.0458	24.2134	20.6713	19.6128	17.2125	16.6642	17.5911	18.0753	20.7046	22.6834	25.8258 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.4951	46.0217	46.8101	48.2645	48.1919	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	225.5626	199.6659	212.3813	187.1237	180.2475	160.7717	157.9051	165.5384	168.6936	188.9893	200.5377	223.1306 (62)
WWHRS	-24.7049	-21.8492	-22.8792	-18.9449	-17.6560	-15.1083	-14.1617	-15.0595	-15.6317	-18.4280	-20.8767	-24.2474 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
	200.8577	177.8167	189.5021	168.1788	162.5915	145.6633	143.7434	150.4789	153.0620	170.5613	179.6609	198.8832 (64)
									Total per year (kWh/year) = Sum(64)m =			2040.9999 (64)
12Total per year (kWh/year)												2041 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000 (64a)
Heat gains from water heating, kWh/month												
	70.7955	62.5917	66.4127	58.1501	55.8489	49.6598	48.6416	51.0597	52.1148	58.6348	62.6103	69.9868 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.1502	89.8448	81.1502	83.8552	81.1502	83.8552	81.1502	81.1502	83.8552	81.1502	83.8552	81.1502	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	(71)
Water heating gains (Table 5)													
	95.1552	93.1423	89.2643	80.7641	75.0658	68.9719	65.3785	68.6286	72.3817	78.8103	86.9587	94.0683	(72)
Total internal gains													
	384.0016	392.2920	375.6657	361.2408	341.9440	325.3169	312.1787	313.8202	324.3319	339.6852	361.4320	376.0749	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.2200	10.6334	0.6300	0.7000	0.7700	23.4629	(74)
Southeast	1.4900	36.7938	0.6300	0.7000	0.7700	16.7546	(77)

Solar gains	40.2174	73.3779	115.2405	170.7669	219.0553	230.2911	216.6459	178.2642	133.8888	84.9166	49.0126	33.8982	(83)
Total gains	424.2190	465.6699	490.9062	532.0077	560.9993	555.6080	528.8246	492.0844	458.2207	424.6017	410.4446	409.9731	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.5001	65.6543	65.8061	66.5288	66.6658	67.3109	67.3109	67.4318	67.0610	66.6658	66.3892	66.1026	
alpha	5.3667	5.3770	5.3871	5.4353	5.4444	5.4874	5.4874	5.4955	5.4707	5.4444	5.4259	5.4068	
util living area													
	0.9922	0.9860	0.9725	0.9237	0.8051	0.6104	0.4516	0.5040	0.7551	0.9412	0.9844	0.9935	(86)
MIT	19.9359	20.0878	20.3134	20.6329	20.8725	20.9777	20.9964	20.9936	20.9325	20.6399	20.2443	19.9121	(87)
Th 2	20.0335	20.0355	20.0375	20.0470	20.0487	20.0570	20.0570	20.0585	20.0538	20.0487	20.0452	20.0414	(88)
util rest of house													
	0.9898	0.9817	0.9637	0.8997	0.7516	0.5287	0.3566	0.4041	0.6769	0.9174	0.9788	0.9914	(89)
MIT 2	18.8087	19.0024	19.2872	19.6817	19.9447	20.0447	20.0559	20.0563	20.0098	19.6990	19.2094	18.7844	(90)
Living area fraction										fLA = Living area / (4) =		0.5202	(91)
MIT	19.3951	19.5671	19.8211	20.1765	20.4274	20.5300	20.5451	20.5439	20.4898	20.1884	19.7477	19.3710	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3951	19.5671	19.8211	20.1765	20.4274	20.5300	20.5451	20.5439	20.4898	20.1884	19.7477	19.3710	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9877	0.9790	0.9613	0.9034	0.7741	0.5706	0.4062	0.4562	0.7148	0.9215	0.9766	0.9896	(94)
Useful gains	419.0091	455.9135	471.8882	480.6011	434.2935	317.0029	214.7835	224.4644	327.5380	391.2585	400.8257	405.6972	(95)

Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	848.2163	822.2302	745.0507	623.8469	481.8295	324.2536	215.7182	226.1813	350.6943	529.3677	701.1775	844.7134 (97)
Space heating kWh	319.3302	246.1648	203.2328	103.1370	35.3668	0.0000	0.0000	0.0000	0.0000	102.7532	216.2533	326.6280 (98a)
Space heating requirement - total per year (kWh/year)												1552.8662
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	319.3302	246.1648	203.2328	103.1370	35.3668	0.0000	0.0000	0.0000	0.0000	102.7532	216.2533	326.6280 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1552.8662
Space heating per m2											(98c) / (4) =	29.2994 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	319.3302	246.1648	203.2328	103.1370	35.3668	0.0000	0.0000	0.0000	0.0000	102.7532	216.2533	326.6280	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000		(210)
Space heating fuel (main heating system)	345.5954	266.4121	219.9490	111.6202	38.2758	0.0000	0.0000	0.0000	0.0000	111.2048	234.0403	353.4936	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	200.8577	177.8167	189.5021	168.1788	162.5915	145.6633	143.7434	150.4789	153.0620	170.5613	179.6609	198.8832	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.3697	85.0785	84.5317	83.3657	81.7122	80.3000	80.3000	80.3000	80.3000	83.3306	84.7797	85.4371	(217)
Fuel for water heating, kWh/month	235.2800	209.0030	224.1788	201.7363	198.9806	181.3989	179.0080	187.3958	190.6127	204.6802	211.9150	232.7834	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8614	13.5268	12.1794	8.9232	6.8925	5.6312	6.2876	8.1728	10.6157	13.9284	15.7321	17.3300	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.3367	-21.3139	-32.2925	-38.3464	-43.1634	-40.9757	-40.4979	-37.3400	-32.0730	-25.2773	-16.1553	-12.2713	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.0639	-10.8975	-22.1172	-33.8930	-45.4704	-45.9090	-45.3474	-38.0761	-27.5067	-15.7802	-6.8249	-3.9849	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1680.5911 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	2456.9726 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	136.0812 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-654.9144 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3704.7305 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year

Space heating - main system 1	1680.5911	0.2100	352.9241 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2456.9726	0.2100	515.9643 (264)
Space and water heating			868.8884 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	136.0812	0.1443	19.6407 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-354.0433	0.1335	-47.2537
PV Unit electricity exported	-300.8711	0.1253	-37.7061
Total			-84.9598 (269)
Total CO2, kg/year			815.4986 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.3900 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1680.5911	1.1300	1899.0680 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2456.9726	1.1300	2776.3791 (278)
Space and water heating			4675.4471 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	136.0812	1.5338	208.7258 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-354.0433	1.4932	-528.6623
PV Unit electricity exported	-300.8711	0.4600	-138.3993
Total			-667.0616 (283)
Total Primary energy kWh/year			4347.2120 (286)
Target Primary Energy Rate (TPER)			82.0200 (287)